VETERINARY MEDICINE

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Vol. XLV AUGUST 1950 No. 8

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In This Issue . . .

Hospital Management—Joseph B. Engle 303
Serum Levels of Horses Following Intramuscular Injection of Aqueous Suspension of Procaine Penicillin—E. R. Doll, M. Elizabeth Wallace, and William H. McCollum 309
Veterinarians' Role in Public Health 311
Aureomycin, an Introduction to its Pharmacology and Activity—L. A. Kanegis, J. S. Kiser, A. C. Dornbush, R. L. Burkhart, S. M. Gadekar, G. C. de Mello, and E. J. Pelcak 313
Occurrence of the Ear Mite, *Raillietia Auris* (Leidy, 1872), of Cattle in Colorado—O. Wilford Olsen, and Frank K. Bracken 320
Further Studies on *In Vitro* Cultivated Pneumoencephalitis (Newcastle Disease) Virus and Its Use as a Vaccine—R. A. Bankowski 322
Some Clinical Uses of a New Antihistamine—G. R. Moore 328
Principles of Animal Health—R. R. Dykstra 330
Editorial Comments . . .
2-Amino-5-Nitrothiazole in Enterohepatitis of Turkeys 329
Federal Grade Stamp on Uninspected Poultry and Rabbits No Assurance of Wholesomeness 331
Increase in Real Wages 332
A.V.M.A. Miami Beach Meeting 332
Poultry Subject to Import Regulations 333
Doctor Dykstra Honored at Iowa State College 334
New Breed of Small White Turkeys 334
Veterinary Parasitology—A. O. Foster 335
Poultry Practice Problems—W. R. Hinshaw 336
Abstracts of Literature . . .
Aureomycin Stimulation of Chick Growth 337
Milk Protein for Treatment of Protein Deficiencies 337
Rhesus Factor in Veterinary Medicine 337
Calcium Metabolism and Requirements of Farm Animals 337
Clinical Reports . . .
Aureomycin: Its Topical Use in Dermatitis in Dogs—R. L. Burkhart and Jack Black 338
The Effect of Varying Levels of Thyroidal Stimulation on Adrenals under Different Environmental Temperatures—M. Maqsood 339
Effect of Hypo- or Hyperthyroidism on the Internal Body Temperatures of the Rabbit and Sheep—M. Maqsood 340
Book Reviews . . .
Lehrbuch der Speziellen Chirurgie für Tierärzte und Studiernede (Textbook of Special Surgery for Veterinarians and Students)—Erich Silbersiepe and Ewald Berge 341
Principles of Hematology—Russell L. Haden 341
Animal Diseases in South Africa—H. W. Henning 342
Antibiotics—Robertson Pratt and Jean Dufrenoy 342
Textbook of Meat Inspection—Horace Thornton 342
Bulletins, Circulars, Booklets 342
Veterinary Items of Interest 344
Examinations XXXIII
Coming Meetings XXXV
Necrology XLI

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Hospital Management*

JOSEPH B. ENGLE, D.V.M., Summit, New Jersey

A HOSPITAL for human beings to qualify and be placed on the approved list of the American College of Surgeons must have a competent and well trained superintendent. The doctors' only concern is the medical care of the patient. If a room is not clean and tidy, the medical staff is not blamed and criticized. Many of these hospitals have been established fifty years or more and are a part of and supported by the community. Doctors come and go, but the policy and management of the hospital are maintained by a board of directors, who, in turn, appoint a trained business manager to carry out their instructions.

Small animal hospitals, as we know them today, are a comparatively new institution, most of them having been established after 1920. In many instances, they are the outgrowth of individual practices, privately owned, and developed around the personality and ability of one or two individuals. The individual is of paramount importance. He is the business manager, diagnostician, surgeon, personnel director, collector of bad accounts, purchaser, and head of the complaint department. In many cases these small animal hospitals have developed to a greater degree than the founder anticipated and a successful manager of a veterinary hospital must develop with the hospital. He must learn to delegate responsibility to others. That is, he must know the personnel in his hospital well enough to place the proper man in the proper job, whether it be lay or professional help. He should not try to do everything himself, but should use his time for professional duties and for general direction.

Remarks will be confined to hospital management. The subject of managing and directing is a large one and this writer does not pose as one with any special training or skill upon the subject. The contents of this article are derived from personal experience and observation.

When a client stops in front of a hospital, if he is an observing individual, he will soon size up the management. Three things will be noticed; if the sidewalks are clean, if the windows are clean, and if the venetian blinds or shades are even. When you go to your office, walk in the front door and take a look. Quite often in making a house call, I form an opinion before entering the house. I remember making a call in July and finding a snow shovel on the porch. Those of you who are in large animal practice may have made a call at a farm in January and have seen a hayloader standing in the middle of a field. That indicates very poor management and also poor pay. There is a close relationship between good management, good housekeeping, and good pay.

When the prospective client enters the waiting room, he forms a first impression that is a lasting one, and it is your duty to see that the room is neat and tidy at all times. Neatness means giving careful consideration to every part of the waiting-room. Are the pictures straight on the walls? Are the magazines on the table neatly stacked? Above all, are they of current issue or are they 1947 numbers? Suitable types of magazines should be kept in the waiting room. A large percentage of clients are ladies and, therefore, magazines should cater to their taste. *Good Housekeeping* and *Ladies' Home Companion* are two which are popular. *Life* is a good magazine for everyone. *Business Week* interests the businessman. Avoid dog magazines filled with nothing but patent medicine advertisements.

The waiting room should be clean, neat, and free from odors. This is a good rule to apply to the entire hospital. Using one odor to kill another is not pleasing to the public. In order to maintain these conditions, some thought must be given to proper cleaning agents for each specific purpose. It goes without saying that plenty of hot water must be available at all times. Three types of cleaning powders are recommended. First, a chlorine preparation for cleaning cages; second, a marble cleanser for tile and cement floors, and for scrubbing the runs; third, a washing powder for kitchen use. With these agents and a little elbow energy, any hospital can be kept clean and odorless. The only other equipment needed is a pail, scrubbing brush, sponge, a three-inch putty knife and plenty of hot water.

Feeding pans should be boiled daily. This

*Presented at the 66th annual meeting of the Medical Association of New Jersey, Trenton, Feb. 2-3, 1950.

is an absolute must to avoid spreading disease from one animal to another. Furthermore, there is absolutely no excuse for any hospital being full of cockroaches, ants, or mice. Any good exterminating company, for a fee of $5. or $6. a month, can control these pests by regular monthly visits.

Office Hours

For the efficient operation of a hospital, it is necessary to establish regular office and visiting hours. This is hard to do at first, but your clientele will soon realize the benefits of regular hours to them, as well as to you. These hours will vary in practically every city or town, as there are many factors affecting them. First, the way a veterinarian wishes to conduct the hospital. Second, if the practice is located in a community where a large percentage of clients are commuters, it will be necessary to have night and Sunday hours in order to give them proper veterinary service. It is wise to post a few rules, such as:

Office Hours—9-11 3-5 7-8 Sunday 11-1

Terms—Cash

Visiting Hours—1-5

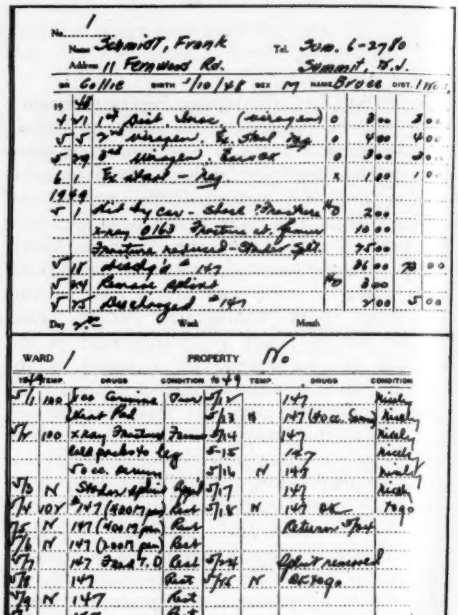
Hospital cases discharged only during office hours.

No dogs discharged after 8 p.m.

No visitors allowed in wards without an attendant.

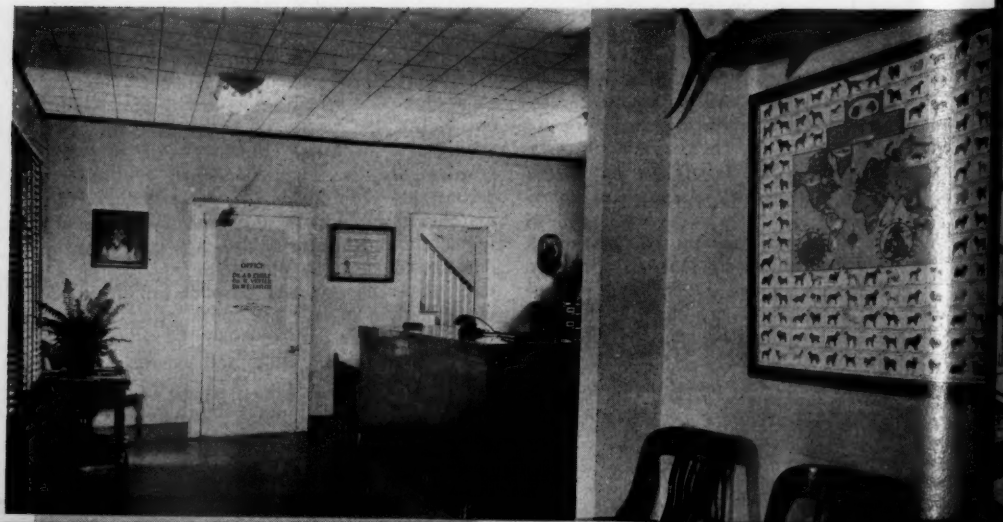
Records

It is essential that every hospital, large or small, should keep individual case records. This can be done easily by a single case card. The face of this card should carry the client's name, address, telephone number and the age, sex, breed and name of the animal. It also should record the charges for services to be rendered to the client. In short, it should cover the commercial aspect of the case. The opposite side of the card can be so ruled.


No. 1
Name Jeanott, Frank Tel. Sum. 6-3780
Address 11 Ferncrest Rd. Summit, N.J.
Mr. Collie Birth 4/10/48 Sex M Name Bruce Dist. 1½
WARD 1 PROPERTY No
DRUGS
CONDITION

Type of permanent case record card showing original entries in use at the Summit Dog and Cat Hospital. The face of the card (upper) provides for notations regarding the owner and the patient and the medical history. Service charges and payments are also noted. The reverse side of the card (lower) is ruled for a daily record of the patient during periods of hospitalization.

The orderly and clean reception room inspires confidence



that a daily record can be kept of temperature, drugs given, and general condition of the patient.

Cards of hospital patients may be kept in a loose-leaf folder, and when cases are discharged, the cards can be placed in the open or closed account files, as may be indicated. When a client returns to the hospital, the same card can be used again and after it is filled, another card can be made and numbered 2. The two cards can then be filed in the same envelope, thus keeping the complete case history of the individual client indefinitely. Cards for urine analysis, blood examinations and postmortem records can be made the same size, which facilitates filing these cards along with the regular case cards. A loose-leaf day sheet should be kept on the desk and every transaction that takes place recorded there. The case cards are posted from this and the sheet is filed away at the end of each day. Each case taken into the hospital is identified by a tag placed on the cage. This tag carries the owner's name, date of entry, diagnosis, and date of discharge, if known. It is best not to accept leashes and other property.

A number system for drugs is almost essential in a hospital where there is more than one doctor practicing. Numbers may be made up in a code, such as external medicines 1 to 20, ointments 80 to 100, etc. In a short time, the staff will memorize most of these numbers. Prescription number should be noted on the case card when medication is dispensed. This not only gives a permanent record, but also makes it easier to refill the prescription if necessary. This number system also facilitates giving instructions to kennelmen and avoids mistakes. The kennelman soon knows the drug by number.

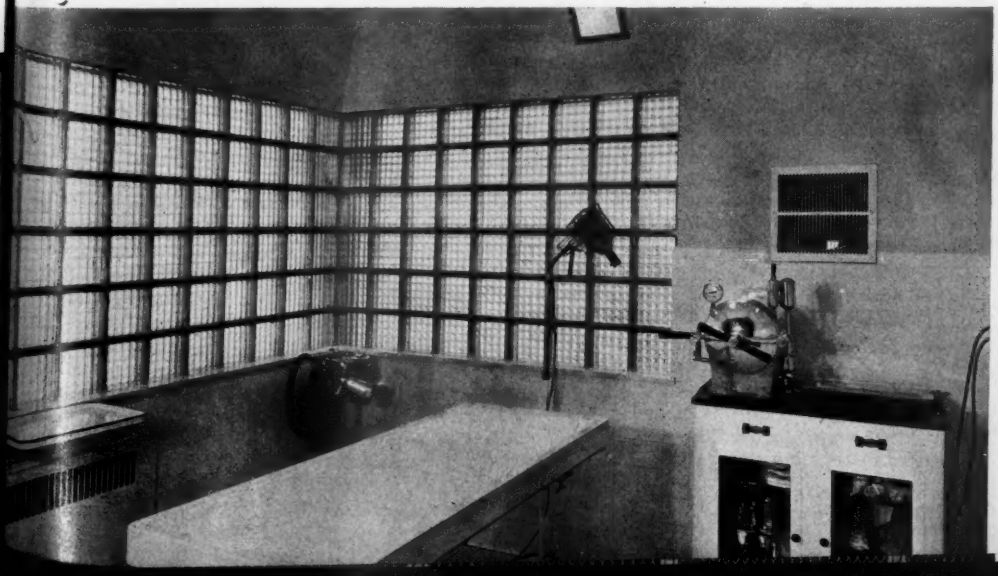
Before completing the topic of records, the writer would like to mention that he has kept a daily record of the number of dogs in the hospital each day, the number of daily office calls, and the total amount of plucking. By checking these records, the number of dogs or office calls handled in any previous period can be compared. This record is easily kept by the use of a symbol on the day ledger. *O* is for office call, *X* is for plucking, *H* is for hospital, and *B* is for boarding. These symbols are placed on the ledger at the time of entry. It takes only a few minutes of the secretary's time at the end of each day to compile this data.

Accounts

One of our hospital rules states "terms cash." However, we follow a policy which may or may not be right. That is, extending credit where credit is deserving. The client is asked the name of his bank and at least one credit reference. Many times he will pay cash rather than bother to give this information. Down payments are required from unknown and out-of-town clients. An effort is made to keep these accounts paid up weekly. Bills on all deceased patients are rendered immediately and not delayed until the first of the month.

If accounts have not been collected after three months, the client is phoned and asked if he will please settle without further delay. This conversation usually indicates his intention of payment. Quite often a satisfactory

View of the surgery, Summit Dog and Cat Hospital, Summit, N. J.



adjustment can be made and the account settled. If not, the client is asked to state a definite date of payment. Then if the promise is not kept, the account is turned over to a collector.

When the old account is collected and the client gets through pouting, he usually will return. As long as the account is not collected, the debtor remains a constant knocker and does not come to the office for fear he will be asked for the money. However, there is still much to be learned about collecting past due accounts.

An accountant audits my books every three months. It is a real advantage to have this report, as it shows at a glance what is spent for wages, food, drugs, fuel, etc. This quarterly report easily can be compared with a previous similar period. Thus, if the food bill is much higher than usual and the number of animals in the hospital remains the same, it is apparent there is a wastage of food. Beware of little expenses. A small leak can sink a ship.

Purchasing

Purchasing supplies is an important part of the business and the director must know his present and anticipate future needs. Records should be kept of the amount of drugs and supplies used. This will permit the purchase in large quantities of all staple drugs, bandages, cotton, cleaning agents, etc., for the coming year, thus getting the advantage of quantity discounts. Even greater savings can be made if two or more neighboring veterinarians combine their orders. Except for specialty items, the bulk of supplies should be purchased from one or two drug houses. It is the wise veterinarian who keeps his credit good, pays his bills promptly, and takes advantage of cash discounts.

Insurance

Social security, state unemployment, sick benefit and withholding tax should be paid promptly and correctly so as to avoid any conflict with the state and federal authorities. For the past ten years, we have had a group insurance policy for all the employees at the hospital. The plan will be described later.

Public liability insurance which protects us on accidents that might happen to our clients while on our premises, should not be overlooked. Furthermore, if employees are paid in cash, be sure to carry adequate payroll insurance. This policy should protect you from the time the money is drawn from the bank until the employees are paid and leave the premises.

At this point, a word of advice is in order. Check your fire insurance policies and compare the amount that you would receive from them in case of fire. Would this amount be sufficient to rebuild your hospital at present day costs? I found mine inadequate.

Another point to keep in mind is that you should not conduct a veterinary hospital or private practice without malpractice insurance, making sure that your associates are also covered. It is imperative that any case of this nature should be reported to the insurance company immediately.

Advertising

A properly conducted veterinary hospital will have a sufficient number of satisfied clients to sing its praises so that there is no necessity for any advertising campaign. Advertising should be kept strictly ethical and along the same lines as for any member of the veterinary profession. A one to two-inch card in the classified section of the local telephone book is sufficient. After visiting a number of hospitals throughout the country, one conclusion has been reached. The hospital with the poorest facilities and most inadequate personnel usually has the largest sign and does the most advertising. Adding improvements and keeping the hospital in good repair at all times is good publicity.

Personnel

A veterinary hospital which accommodates more than 40 patients should have at least two veterinarians. If the hospital accommodates 80 or more patients, there should be at least three veterinarians. A man practicing by himself and hospitalizing an average of 60 dogs probably is not able to give these dogs the necessary amount of medical attention. There are only so many hours in a day and when time has to be divided between office work, outside calls, and surgery, not very much attention can be given to hospital patients.

Sufficient secretarial help should be maintained to keep the hospital records in good order, and render statements promptly. A secretary with a pleasing personality, one who answers the phone promptly, gives courteous answers, and is generally helpful, is a definite asset.

The number of kennelmen employed will vary with the number of dogs in the hospital. There should be at least one kennelman for every 20 dogs in the hospital and one for every 25 dogs in the boarding kennel. We employ one nightman who comes on at 4:30 p.m. and cleans the offices during the night. This is a very satisfactory arrangement. If there is a large amount of plucking, bathing and grooming, it may be necessary to have an additional trained man for this purpose. If care is used in selecting him, he can be

used for general repair work at all times, and for painting in the winter. Our men work a six-day week with every other Sunday off. High school boys are used to help out on Sundays when half of the men are off. Vacations with pay are granted to all employees after one year's employment. There is a suggestion I would like to offer at this point in regard to employees. No matter how clean the hospital may be, if the kennelman appears with a three days' growth of beard and an old dirty white shirt, the client will get the impression that if he is careless with himself, he is also careless with his work. This is often the correct assumption. For a number of years I furnished my men with khaki uniforms. However, for the last four years I have not done this, because of the increase of labor costs and other overhead expenses. I hope to be able to go back to this practice before long. Our men are trained in the correct manner of handling dogs. They are taught how to clean and above all, are discouraged from talking too much with the clients. They are instructed to tell the client "It is best to ask the doctor."

Employer and Employee Relationship

This is a subject which has become nationally important in the last few years. With the gradual and effective organization of labor, big business has been forced to listen to the demands of labor by national laws. This has made employees in small businesses conscious of the fact that they too should be given recognition by the employer, and it is the wise employer who recognizes this fact. The unionization of labor has two objects in mind; shorter hours and higher pay. It is true that the average veterinary hospital has but few employees. However, if the management can make the employees feel that they are part of the business and that they will profit by aiding in the successful running or operation of the business, both the employer and employee will benefit.

One method employed in an effort to stimulate personal interest is to place the men on a basic salary, plus commission. For example, the man in charge of the distemper ward receives a set salary plus $2. for every dog that goes home alive. You can readily see that when he has ten dogs in the distemper ward, his interest is keen. He is ready and willing to nurse his patients and give them the best of care.

Six years ago we adopted a plan of allowing a 50-cent bonus on every dog that was plucked. As a result of this, our plucking business has increased in the last six years. The man who plucks the dog talks to the client to make sure of the way it is to be done. This makes the client feel that the kennelman is anxious to please and assures future trimming business.

When interviewing a man for a position at the hospital, we make sure that he has sufficient basic education to do the job that he is to fill. We are convinced that you never know a man until you have worked with him. Never hire a man without adequate references nor one who has a history of a new job every three months. If he wouldn't work for the other fellow, he won't work for you.

Comfort for patients and ease of maintenance feature this cage unit

The group insurance previously mentioned has proved very satisfactory, and is appreciated by the employees. An employee has to be with us at least one year before he is eligible for this insurance. At that time, if he wishes, he is allowed $1,000 of life insurance. The employee pays 50 cents a month or $6. a year for this policy. We pay the balance. After five years of service, the employee is allowed a $2,000. policy on the same basis. The cost of this insurance for a man 30 years of age is 82 cents per $1,000. a month. An associate veterinarian is allowed $4,000. after one year's employment. We have not solved all of our labor problems, but have attempted to make our men conscious of the fact that they are part of an organization which is capable of giving them a livelihood and security, providing they are willing to cooperate and give an honest day's labor.

Control of Contagious Diseases

No paper on management of a veterinary hospital would be complete without giving some attention to control of contagious diseases. Distemper can be controlled fairly satisfactorily by the systematic inoculation with distemper serum of all dogs under two years of age which enter the hospital. The only exceptions in our hospital are those which we know have had distemper and have been treated by us. The dose of serum we use is 1 cc. per pound of body weight. This provides satisfactory protection if it is repeated within ten days. Do not trust serum too long. The label on the bottle may say protection for 30 days, but to protect your reputation, do not trust the serum more than ten days. Dogs presented for boarding are handled the same as hospital cases except virogen (Pitman-Moore) is used in place of serum. Even though the dog has had complete distemper inoculations within the year, another booster injection of virogen is given. For satisfactory results this must be administered on the day of entry. Dr. L. W. Goodman of Manhasset, Long Island, claims good results by the use of virogen in both the hospital and the boarding kennel. However, we prefer serum for hospital patients.

If you claim to operate a small animal hospital, give your community complete veterinary hospital service. A veterinarian should be available for emergencies at all times. Have at least one attendant on the premises 24 hours a day. Furthermore, equip and maintain an isolation ward so that infectious cases can be given proper care.

Infectious feline enteritis and infectious feline coryza are another hospital headache. The best way to handle this is to spread cats throughout the hospital, one or two in a ward. Here, again, make sure that all dishes are boiled.

Feeding

No matter how carefully patients are cared for, no matter how well they are medicated, if they are not fed correctly, results will not be satisfactory. Therefore, it is imperative to have a clean kitchen in which to prepare the food and to clean and boil the feed pans. Horse meat is used as a general diet with a fine kibbled biscuit to which are added necessary salt and fat. Pablum or cerevim is used for sick dogs and puppies. It is necessary to have milk and broth on hand at all times for special cases. Special diet formulas are now being prepared by the Hill Packing Company, Tokepa, Kan., and are worthy of consideration.

The feeding of a sick animal is not a job for just anyone. It should be handled by someone who really understands the quantity of food to be given the particular dog. If a man overfeeds the boarders, giving the small dogs too much, there is likely to be a lot of diarrhea the next day. On the other hand, if the large dogs are fed too little, they will soon lose weight and there will be a disgruntled owner to pacify.

Here are a few suggestions worth following:

(1) It is as important to discharge a hospital patient correctly as it is to take one in. Be sure the owner has proper instructions in regard to diet, medication, exercise, and amount of water. Also be sure to state whether the dog is to be returned for further medication.

(2) If a patient gets away by accident, notify the owner at once and make every effort to find it.

(3) Notify the owner immediately if the patient's condition degenerates.

(4) Notify the clients of all deaths immediately. Ascertain their desire in regard to the disposal of the body.

Remember, that our greatest asset is public confidence. Never misuse it. No matter how smart a veterinarian you may be, how fine a hospital you may possess, it will be of no value, unless the people in your community have confidence in you and your organization.

Here are four rules that are essential to the successful operation of a veterinary hospital:

(1) Have sufficient trained personnel to render average veterinary service promptly.

(2) Maintain cleanliness and tidiness in the hospital at all times.

(3) Control parasites, contagious and communicable diseases in hospitalized animals.

(4) Charge and collect a fee for services that is fair to client and veterinarian.

Serum Levels Of Horses Following Intramuscular Injection Of Aqueous Suspension Of Procaine Penicillin*†

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IN domestic animals, amorphous and crystalline penicillin in aqueous solution maintained serum levels of relatively short duration[1]. Preparations containing amorphous or crystalline penicillin in an oil and beeswax base as suggested by Romansky[2] resulted in delay of absorption, but serum levels of animals following intramuscular injection were very variable in both concentration and duration[1]. The introduction of procaine penicillin,[3] a relatively insoluble form, provided a more satisfactory material than the oil and wax preparations for maintaining blood levels for long periods. Detectable serum levels persisting for 24 to 48 hours or longer were readily obtained in domestic animals with procaine penicillin in oil or procaine penicillin in oil with 2% aluminum monostearate[1]. The investigation reported here was undertaken to obtain information on the dosage of procaine penicillin in aqueous suspension required to maintain measurable serum levels for periods of 24 to 72 hours in horses.

Methods

The assay procedure[4] employed serial dilutions of serum in broth with *Streptococcus equi* as the test organism. Penicillin injections were made into the musculature of the neck. The entire dose was injected at one site. The mares and foals were apparently normal. They were quartered in box stalls and maintained on regular feeding schedule throughout the test period. Blood samples for assay were obtained aseptically from the jugular vein at the first hour following injection of the penicillin and at intervals of 12 hours thereafter. The blood samples were placed in a water bath at 37 C. for one hour, centrifuged, and the serum removed. The serum was frozen at —20 C. until the assays were made. The longest period of storage was 74 to 76 hours for the first hour sample. The penicillin used in this study was an aqueous suspension of procaine penicillin G (Abdocillin-DC§) containing 600,000 units/cc. and packaged in 1 cc. disposable cartridges.

Results

Doses of 1 cc., 600,000 units, were administered to five foals weighing from 160 to 240 pounds each. In units per pound of body weight, the doses varied from 2,500 to 3,750 units. Measurable serum levels were obtained for 12 hours in one trial, 24 hours in two trials, and 36 hours in two trials. Five foals weighing from 150 to 230 pounds received doses of 2 cc., 1,200,000 units, varying from 5,216 to 8,000 units per pound of body weight. The duration of the serum level response was 24 hours for one trial, 36 hours for three trials, and 48 hours for one trial. Five dosage trials were made on foals weighing from 180 to 260 pounds using doses of 4 cc., 2,400,000 units. The dosage per pound of body weight varied from 9,230 to 13,333 units of penicillin. The measurable serum level period persisted for 60 hours in one trial and for 72 hours in four trials. Serum concentrations of 0.02 unit per cc. of serum were obtained in four trials for the last samples showing a measurable quantity of penicillin. Except for these, acceptable therapeutic serum levels were present throughout the detectable serum level period in all dosage trials. Results of the individual trials are summarized in table 1.

In adult horses, weighing from 900 to 1,080 pounds, five trials were made with doses of 3 cc., 1,800,000 units of penicillin. The dosage per pound of body weight varied from 1,650 to 1,998 units. A detectable quantity of the antibiotic was present in the serum of three horses for 12 hours each. In one, the duration of the serum level response was 24 hours. A measurable quantity was not ob-

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tained in one mare weighing 920 pounds and receiving 1,956 units per pound of body weight. Doses of 6 cc., 3,600,000 units, were administered to the same group of mares. In these trials, the dosage in units per pound of body weight varied from 3,300 to 3,996 units. The duration of the measurable serum level response was 48 hours in two trials and 60 hours in three trials. Doses of 9 cc., 5,400,000 units, were administered to three mares weighing 900, 920, and 920 pounds. In units per pound of body weight, the doses were 5,869 and 6,000 units. The duration of the measurable serum level period for the three mares was 36, 48 and 60 hours. Serum levels of 0.02 to 0.04 unit per cc. of serum were obtained for a number of assay periods in all dosage trials, and for the 3 cc. dose the serum levels did not exceed this concentration in three trials. Results of the individual determinations are summarized in table 2.

According to results obtained with adult horses, it appears that doses of 6 cc., 3,600,000 units, of aqueous suspension of procaine penicillin, should provide adequate serum levels for treatment of infections caused by organisms highly susceptible to penicillin. Increasing the dosage to 9 cc., 5,400,000 units, did not produce prolongation of the measurable serum level period but resulted in higher serum concentrations. Doses of 3 cc., 1,800,000 units, failed to maintain measurable serum levels for 24 hours and therapeutically effective serum levels were not obtained in some trials.

Summary

In young foals, doses of 1, 2, and 4 cc. of aqueous suspension of procaine penicillin (abdocillin-DC, 600,000 units per cc.) maintained effective serum levels for periods of approximately 24, 48 and 72 hours respectively. In adult horses, doses of 3 cc. did not produce therapeutically satisfactory serum levels. Doses

(*Continued on page 327*)

TABLE 1. SERUM LEVELS OF FOALS RESULTING FROM INTRAMUSCULAR INJECTION OF AQUEOUS SUSPENSION OF PROCAINE PENICILLIN

Weight in Pounds	cc.	Dose Units/lb.	Units of penicillin per cc. of serum at specified hours following injection						
			1	12	24	36	48	60	72
240	1	2,500	0.16	0.08	0.08	0.04	0.00	0.00	0.00
240	1	2,500	0.08	0.16	0.00	0.00	0.00	0.00	0.00
230	1	2,608	0.32	0.16	0.04	0.00	0.00	0.00	0.00
170	1	3,529	0.32	0.16	0.04	0.00	0.00	0.00	0.00
160	1	3,750	0.64	0.32	0.04	0.04	0.00	0.00	0.00
230	2	5,216	0.32	0.08	0.04	0.02	0.00	0.00	0.00
230	2	5,216	0.16	0.32	0.32	0.08	0.00	0.00	0.00
220	2	5,454	0.64	1.28	0.08	0.00	0.00	0.00	0.00
160	2	7,500	0.32	0.32	0.16	0.02	0.00	0.00	0.00
150	2	8,000	0.32	1.28	0.32	0.32	0.08	0.00	0.00
260	4	9,230	0.16	0.08	0.08	0.04	0.04	0.04	0.02
260	4	9,230	0.16	0.08	0.04	0.04	0.04	0.04	0.04
250	4	9,600	1.28	0.16	0.08	0.08	0.04	0.02	0.00
190	4	12,631	0.32	0.16	0.08	0.08	0.08	0.08	0.08
180	4	13,333	0.64	0.64	0.16	0.16	0.08	0.16	0.08

TABLE 2. SERUM LEVELS OF MARES RESULTING FROM INTRAMUSCULAR INJECTION OF AQUEOUS SUSPENSION OF PROCAINE PENICILLIN

Weight in Pounds	cc.	Dose Units/lb.	Units of penicillin per cc. of serum at specified hours following injection						
			1	12	24	36	48	60	72
920	3	1,956	0.02	0.04	0.00	0.00	0.00	0.00	0.00
1,000	3	1,800	0.04	0.08	0.00	0.00	0.00	0.00	0.00
1,080	3	1,650	0.02	0.04	0.00	0.00	0.00	0.00	0.00
920	3	1,956	0.00	0.00	0.00	0.00	0.00	0.00	0.00
900	3	1,998	0.04	0.16	0.08	0.00	0.00	0.00	0.00
920	6	3,912	0.08	0.08	0.02	0.02	0.02	0.02	0.00
1,000	6	3,600	0.02	0.08	0.08	0.04	0.02	0.04	0.00
1,080	6	3,300	0.04	0.08	0.08	0.02	0.04	0.00	0.00
920	6	3,912	0.04	0.16	0.16	0.04	0.02	0.00	0.00
900	6	3,996	0.02	0.16	0.08	0.04	0.02	0.02	0.00
920	9	5,869	0.32	0.16	0.04	0.02	0.00	0.00	0.00
920	9	5,869	0.16	0.16	0.08	0.04	0.02	0.00	0.00
900	9	6,000	0.08	0.08	0.04	0.04	0.02	0.02	0.00

Veterinarians' Role In Public Health*

THE veterinarians' role in the problems of public health is growing in all parts of the country and the science of veterinary public health is growing with it. Unless veterinarians put into practice the new developments in this science, they will not benefit the public nor will they improve the status of the veterinary profession. Outstanding figures in the profession have long contributed importantly to the public health and have improved the status of all the people of the United States and of the whole world. Among these can be listed Gamgee in Britain, Ostertag in Germany, Leonard Pearson in the United States, Salmon's great contributions to meat hygiene near the turn of the century, and many others that could be mentioned.

The problem of bovine tuberculosis is not solved in any country but this, and in several European nations the disease is under control.

Rabies and brucellosis are important diseases to health officers in every section of the United States. They will not be eradicated nor successfully controlled without the support of the veterinary profession and the participation of practitioners generally in the eradication programs.

Rabies is of vital concern to 500,000 persons in this country annually because that number are reported as having been bitten by dogs each year and 40,000 of them take the Pasteur treatment. We have the knowledge and the tools for the complete eradication of this disease. We should attack it on a national scale.

Control of the stray dog and the difficulty of that task has too long been stressed as essential to worthwhile accomplishment in the eradication. The stray dog is not the principal nor the most important factor in the spread of rabies. Comprehensive statistics in the southern states where the dog population is the most dense and the number of strays greatest, show that but 28% of the cases of rabies in dogs occur in strays, and these unwanted animals are responsible for an even smaller percentage of the bites inflicted on persons. Obviously the stray dog's opportunities for biting persons are not nearly so frequent as those of home dogs.

Community-wide vaccination of dogs will control rabies in this animal in any area. It is not possible to vaccinate all dogs in any extensive area, and fortunately it is not essential to the suppression of the disease. A good deal of experience has shown that 100% vaccination is not necessary, as rabies cannot perpetuate itself if 70% of the dogs in a given community are immunized. It may be a coincidence, but this same percentage of immunes will prevent or suppress outbreaks of diphtheria and whooping cough among children. Of course, the goal should not be set at 70% vaccination. We should probably seldom attain either it or eradication if we set our goal so low. The aim should be complete immunization of the dog population and if we fail to attain it, we still shall conquer the disease. At the same time, we should employ all other useful, practicable means of preventing infected dogs from biting susceptible animals, such as confining dogs to the owners' premises, permitting dogs at large only on leash, collecting and destroying strays, etc., and in this way hasten the victory over rabies.

In some parts of the country the wild animal reservoir of rabies infections is important. The red fox is a prolific spreader of rabies, particularly to cattle. All along the Appalachian mountains from New York to Georgia this animal is a common source of rabies infection in domestic animals. Formerly, 800 cases of rabies in dogs occurred in New York state in a single year. By an intensive campaign, that number was reduced so that last year there were only four cases of the disease in dogs. The cases in foxes increased so rapidly that there were 1,000 known infections in foxes in the same period. In handling rabies in wild animals, the conservation authorities should be called upon for assistance. Experience in Georgia and other southeastern states has shown that the conservation forces can reduce the fox or other wild animal population at one-third the cost that we can, with sufficient reduction in numbers for eradication of the disease among these animals. Since the fox is not a gregarious animal, the disease will not be perpetuated among them except where they occur in large numbers, so when the density of the fox population is reduced suf-

*Notes from a paper on the Veterinarians' Role in Public Health, presented by J. H. Steele, D.V.M., M.P.H., Chief, Veterinary Public Health Division, U.S.Public Health Service, Atlanta, Ga., at the 68th annual meeting of the Illinois State Veterinary Medical Association, Peoria, Feb. 1-3, 1950.

ficiently, there is a spontaneous disappearance of the disease from among these animals.

Brucellosis

Brucellosis is another important public health problem, the solution of which is mainly a responsibility of veterinarians. Only milk from brucellosis-free herds should be permitted to be sold as grade A. The ring test recently introduced in this country gives great promise as a means of locating infected herds quickly and inexpensively. Information as to its whereabouts is essential in the control or eradication of any disease. If further use of the ring test lives up to preliminary promises, it will be a tremendous help in the eradication of brucellosis.

Brucellosis is the no. 1 occupational disease of veterinarians. Eradication of it will improve the health of veterinarians and of the public, and at the same time increase the agricultural prosperity.

Trichinosis

The trichinosis incidence rate in the United States is the highest in the world. An extensive investigation begun by the late Dr. Maurice C. Hall and continued by Dr. Willard Wright of the Zoological Division of the U. S. Public Health Service, an investigation that included hundreds of autopsies on the cadavers of persons who had died of all manner of ailments, revealed that 18% of them had at some time during their lives been infected by the Trichinella. The high incidence of trichinosis in this country is due to eating the flesh of garbage-fed swine. Every veterinarian and public health authority knows this and the public should be equally informed. Garbage feeders and their allies have attributed the infection of swine to eating rats harboring Trichinella, but many tests in which dead rats were mixed with garbage and fed to swine have shown that in nearly all cases, the hogs have eaten the garbage and rejected the rat carcasses. Rarely could a hog be induced to attempt to eat a rat and even then he usually gave it up as a bad job. It has been claimed that swine catch and eat rats that are feeding with them, but it has not been explained how a pig can catch an agile rat, nor has it been demonstrated that it occurs or is possible.

Veterinarians should do all they can to discourage feeding of raw garbage. Entirely aside from its public health value, a law to make illegal the feeding of raw garbage to any animal designed to be used for human food would promote the prosperity of the swine industry by decreasing the spread of hog cholera and other diseases of swine, which are frequently spread by contaminated raw garbage.

Other Diseases of Public Health Interest

Among the newer problems of veterinary public health are those posed by swine influenza, hydatid disease and Queensland (Q) fever.

Q fever was first discovered in Montana 13 years ago. Seven years ago the virus was discovered in dead ticks at the Hamilton Montana Laboratory where vaccine is produced for the prevention of Rocky Mountain spotted fever. Since the close of the war, outbreaks of Q fever have been recognized in persons, the first in this country among packing house employees at Amarillo, Tex. Later, the disease occurred over a wide area in southern California, chiefly among persons associated with cattle—dairymen and dairy employees, cattle feeders, etc. The disease is subclinical in animals and of no economic importance to animal husbandry, but it causes a virus pneumonia in persons. The means by which it is spread are not known, but it is thought to be mainly by inhalation. The placenta is a rich source of the virus in infected cattle. Infected sheep eliminate the virus principally in the feces.

Recently, Salmonella infection has been discovered to occur in dogs to an extent of from 2.5% in strays, where the incidence is lowest, to 95% in Greyhound kennels where it is the highest so far determined. Many of the infected animals are carriers and many spasmodic cases of diarrhea in dogs, formerly attributed to other causes, are now recognized to be canine salmonellosis. Some severe outbreaks, running through all the dogs in a kennel or in a veterinary hospital have occurred. As in man and other animals, the principal symptom of salmonellosis in dogs is a more or less severe, acute diarrhea.

An informed veterinary profession and educated citizenry are essential to the solution of the veterinary public health problems that now confront us. Putting into effect the proper control measures will improve the health of our nation and improve its agricultural economy.—D. M. C.

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Of the millions of displaced persons left in the care of UNRRA in Germany, Austria, and Italy following World War II, approximately 205,000 are destined to immigrate to the United States under present legislation. This number may be increased to between 300,000 and 400,000 by legislation now under consideration.—*Pub. Hlth. Rept.*

Aureomycin, An Introduction To Its Pharmacology And Activity

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AUREOMYCIN is an antibiotic produced by a new species of the genus Streptomyces. This soil organism was discovered in a screening program involving more than 900 soil samples and 5,000 isolates, in the laboratories of Dr. B. M. Duggar[1]. The cultivation of this isolate on appropriate media showed a golden-yellow mold which was identified as a species of Streptomyces undescribed up to this time. Because of the golden-yellow pigment produced by the organism, Duggar named it *aureofaciens*.

In the routine screening program,[1] *in vitro* antibiosis was demonstrated against more than 50 organisms, including both human and animal pathogens, plant pathogens, and various fungi. Three colonies of each isolate were grown on standard Petri dishes for approximately 75 hours. The plates were then flooded with the assay organism. The flooding organism was directly exposed to the antibiotic secreted by the growing colonies, and the degree of activity was measured by the diameter in millimeters of the zones of inhibition.

Aureomycin is a weakly basic compound which contains nitrogen, non-ionic chlorine, carbon, hydrogen, and oxygen, and has a molecular weight of 508. The crystalline free base is practically insoluble at neutral pH, but is soluble in aqueous solution above pH 8.5. Its melting point is 168-169 C. Aureomycin forms a hydrochloride which is soluble in water to the degree of about 14 mg. per ml. at 25 C.; the solution has a pH of 2.8-2.9[2].

Stability

Aureomycin hydrochloride, in the dry crystalline form, is highly stable[3]. In acid solutions in high concentration it is stable for two or three weeks at 4 C. or 37 C.[3,4]. Its activity is rapidly reduced in neutral[4] or alkaline solutions,[5] including culture media,[6,7] especially at incubator or room temperatures, and somewhat less rapidly at refrigeration temperatures.

Toxicity

Aureomycin has a low order of toxicity in mice, rats, cats, dogs, and rabbits[5,7,8,9]. However, a cumulative toxic effect in the guinea pig, similar to that noted when penicillin was used in this species of animal,[10,11] has been noted[9,12].

In acute oral toxicity tests,[5] mice tolerated 1,500 mg. per kg. and rats 3,000 mg. per kg. The intravenous $l.d._{50}$** for the hydrochloride, pH 2.5, was 134 mg. per kg. for mice and 118 for rats; there was no significant difference when the alkaline form at pH 8.5 was given. At pH 8.5, 50 mg. per kg., administered intravenously at the rate of 10 to 20 mg. per kg. per minute, was tolerated by dogs, cats, rabbits, guinea pigs, and mice. Dogs receiving 20 mg. per kg. intravenously twice daily for six days showed no ill effects, except some perivascular irritation at the site of injection. No significant changes in blood pressure and respiration were produced when aureomycin, pH 8.5, was administered to dogs intravenously, at a rate of 10 mg. per kg. per minute. The hydrochloride was tolerated almost as well except that doses of 30 to 40 mg. per kg. produced hemoglobinuria. This same condition was reproduced when hydrochloric acid was administered in amounts equivalent to those present in 30-40 mg. per kg. of aureomycin hydrochloride. Conversely, the alkaline form never produced this reaction even in doses of 100 mg. per kg. Similar intravenous doses were tolerated in cats. Mice, rats, and dogs, given 100 to 200 mg. per kg. per day orally for 12 weeks showed normal growth, appearance, hematology, clotting time, liver function, blood sugar, blood pressure and kidney function. Subcutaneous, intraperitoneal, and intramuscular injections were irritating, and persisted at the injection site due to poor absorption.

The vasomotor action of epinephrine, acetylcholine, or histamine, or the effect of vagal stimulation on the heart were not affected by aureomycin. It is mildly diuretic and does not produce albuminuria.

In large animals, following oral administra-

*Lederle Laboratories Division, American Cyanamid Company.

**The single dosage required to kill 50% of the animals on test.

tion, it may cause inappetence and dehydration. Administered orally to ruminants, it upsets the rumen flora and causes digestive disturbances.

ABSORPTION, EXCRETION AND DISTRIBUTION

Laboratory Animals

Aureomycin is rapidly absorbed. One hour after oral administration in laboratory animals, measurable amounts of aureomycin appeared in the urine even after doses as low as 5 mg. per kg., and excretion continued for six to 12 hours. There was rapid excretion for the first two hours following intravenous administration, slower excretion from the second to fourth hours, and low excretion to the sixth hour[5].

Two hours following the last of three doses of 20 mg. per kg. each, which had been administered intravenously at two-hour intervals, very high blood concentrations, 40 micrograms† per ml., were present in dogs[5]. Blood serum concentrations of 1.25 micrograms per ml. were recorded 15 minutes to one hour following a single intramuscular injection of 20 mg. per kg. in rabbits and 40 mg. per kg. in dogs, but no significant concentrations were obtained in samples drawn later than one hour after administration[8].

The drug passed the blood-brain barrier into the spinal fluid in therapeutically effective amounts, 0.8 microgram per ml., within six hours after intravenous administration of three doses of 20 mg. per kg. at two-hour intervals,[5] although, following intramuscular administration, no measurable concentrations were found[8].

Man

Many published reports of similar studies in man have given like results. After single oral doses of 500 or 750 mg., aureomycin appeared in the urine within one hour, in high concentrations between two and 16 hours, and measurable amounts for more than 33 hours. After doses of 250 or 500 mg. twice a day for seven or ten days, the drug was present in the urine for 72 hours and longer after the last dose[18].

Following oral administration, blood concentrations rose rapidly and were maintained for several hours. Repeated oral doses maintained therapeutic concentrations[14,15,16]. Serum levels equal to the maximum concentrations obtained after oral administration of 1 gm. were obtained within five minutes after intravenous administration of 50 mg., and fell rapidly within one hour and more slowly thereafter[16].

Aureomycin is absorbed and distributed in all body fluids[14,15]. Variable results have been obtained in the detection of the drug in cerebrospinal fluid following oral and intramuscular administration[14,17]. The concentration of aureomycin in the cerebrospinal fluid will be proportional to the concentration in the serum and it has been shown that the intramuscular route does not permit rapid absorption and consequent high serum concentration. If a therapeutic concentration is required in the cerebrospinal fluid, intravenous administration of large amounts of aureomycin is necessary.

Aureomycin Serum Concentrations in Animals

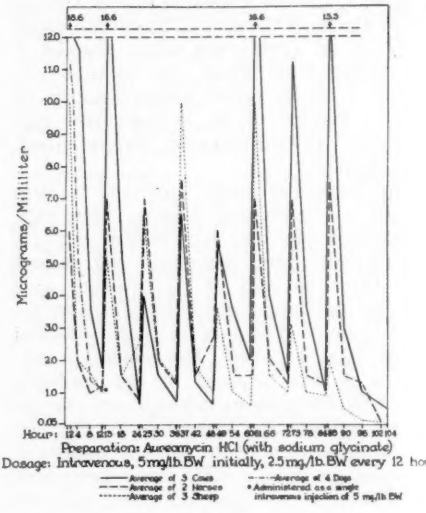
Micrograms/Milliliter
Hours
Preparation: Aureomycin HCl (with sodium glycinate)
Dosage: Intravenous, 5 mg/lb BW initially, 2.5 mg/lb BW every 12 hours
Average of 3 Cows
Average of 2 Horses
Average of 3 Sheep
Average of 4 Dogs
* Administered as a single intravenous injection of 5 mg/lb BW

Fig. 1

Domestic Animals

Blood level curves in cows, horses, sheep and dogs, following the administration of aureomycin hydrochloride with sodium glycinate intravenously at the rate of 5 mg. per pound body weight initially, followed by maintenance doses of 2.5 mg. per pound, are shown in figure 1. It would appear from this and similar data that this dosage schedule in the various species cited results in what may be considered adequate therapeutic levels throughout the course of treatment. More extensive studies on blood levels will be reported later.

†Microgram = gamma = one one-thousandth of a milligram or one one-millionth of a gram.

Assay Methods

The determination of the concentration of a drug in body fluids is important in the evaluation of the therapeutic effect of the drug. *In vitro* studies show a direct relationship between drug concentration and bacteriostatic and bactericidal activity. The determination of the concentration of the drug in the blood is an indication of the probable drug concentration at the site of infection.

There are two assay methods††, devised by Dornbush and Pelcak, which are now employed. The simplest method of assay is a tube-dilution method. A strain of *Bacillus cereus*, variety *mycoides*, a gram-positive spore-forming bacillus, is the test organism used. The aureomycin standard is serially diluted through a specified number of tubes as is the sample to be assayed. A broth culture of the test organism is added to each tube and incubated at 37 C. in a water bath for four hours. The growth of the organism in the dilutions of body fluid is then compared with the growth in the standard series[18].

A more accurate but more cumbersome method is the turbidimetric method, in which a quantitative estimate of the amount of growth of the assay organism is made by measuring the transmission of light through the culture.

In Vitro Activity

The degree of *in vitro* activity of aureomycin against a wide variety of microorganisms pathogenic for man and animals has been determined, including bacteriostatic and bactericidal activity against both gram-positive and gram-negative bacteria. The majority of both gram-negative and gram-positive bacteria are inhibited by less than 1 microgram per ml. (1:1,000,000).

Tables 1 and 2 summarize results of tests of activity of aureomycin against various animal pathogens. In table 1, all strains tested, with the exception of *Streptococcus gallinarum*, are completely inhibited by less than 1 microgram per ml., some by as little as 0.04 microgram per ml. In table 2, concentrations in both broth and milk, necessary to inhibit growth of organisms isolated from cases of bovine mastitis, are given. There is very little difference between the activity in broth and in milk. All organisms tested, with the exception of *Pseudomonas aeruginosa*, are highly susceptible to the action of aureomycin. Species of the genera Pseudomonas and Proteus usually require high concentrations for inhibition. These concentrations are often difficult to achieve in the infected animal.

Tables 3 and 4 compare aureomycin with other antibiotics on a weight/volume basis. All strains of Clostridium tested are inhibited by less than 1 microgram per ml. of aureomycin and penicillin, and are 125 to 150 times more sensitive to aureomycin than to chloromycetin. Results of *in vitro* tests using organisms isolated from man are similar to those obtained with animal pathogens, with aureomycin highly active against both gram-negative and gram-positive bacteria[20,21,22,23,24,25]. Against many gram-negative organisms, aureomycin is the most active antibiotic tested.

Table 1. In Vitro Susceptibility to Aureomycin of Miscellaneous Veterinary Pathogens

Organism	Aureomycin microgram/milliliter inhibiting growth
Bacillus anthracis	0.04
Pasteurella multocida	0.04
Brucella abortus	0.16
Brucella bronchisepticus	0.16
Listeria monocytogenes	0.63
Malleomyces mallei	0.63
Salmonella pullorum	0.63
Salmonella gallinarum	1.25
Leptospira canicola[19]	0.1
Leptospira icterohaemorrhagiae	0.1

In addition to wide species variation in the bacteriostatic activity of aureomycin, there is marked variation between different strains within the same species. As examples, some strains of Proteus and Pseudomonas are resistant,[4,26,27] while others are sensitive[25]. Table 4 shows some strains of Proteus inhibited by less than 0.012,[25] while others required concentrations of 250 micrograms per ml.[20,21] and Pseudomonas by 0.4 to more than 200 micrograms per ml.[20,21,25].

Organisms resistant to other antibiotics are not resistant to aureomycin[3,4,23,28]. There has been little evidence to indicate that bacterial resistance to aureomycin will be a problem[3,4,23,28,29]. Production by bacteria of an antagonist or neutralizer against aureomycin, such as penicillinase which inactivates penicillin, has not been demonstrated[3,4,9].

In vitro activity depends upon the concentration of the antibiotic, the number of organisms present, their phase of growth, and the pH of the test medium[3,4,6]. Whole blood and serum require higher concentrations for bacteriostasis than synthetic media[4,6,23,30].

Results *in vitro* and *in vivo* have not always been analogous, as is generally expected. In the test tube, aureomycin has, at times, ap-

††These methods, in detail, can be obtained on request.

peared to be less effective against certain organisms than other antibiotics. This is probably due to the fact that aureomycin deteriorates rapidly under experimental *in vitro* conditions at neutral or alkaline pH[6]. However, clinically, results have far surpassed expectations based on laboratory data. In brucellosis, streptomycin was found to be more active *in vitro*, but clinical results have shown that aureomycin is far more active in man as a bacteriostat[81,82].

TABLE 2. IN VITRO SUSCEPTIBILITY TO AUREOMYCIN HYDROCHLORIDE OF ORGANISMS ISOLATED FROM CASES OF BOVINE MASTITIS

Organism	Aureomycin HCL microgram/milliliter inhibiting growth Broth	Milk*
Str. agalactiae	0.63	0.63
Str. dysgalactiae	1.25	1.25
Group C Streptococci	0.16-2.5	0.63-2.5
Str. uberis	0.32	1.63
Staph. aureus (B toxin)	0.63	1.25
Staph. aureus (A toxin)	——	0.16
Staph. aureus (*coagulase*+)	0.63	0.63
Staph. aureus (coagulase -)	0.02	0.16
Ps. aeruginosa	10.0	—
C. pyogenes	1.25	—
Bacillus no. 5 control	0.04	0.04

*Tests made in fresh skim milk (not whey) with bromcresol purple.

EFFECT ON EXPERIMENTAL INFECTIONS

Rickettsial and Viral

In animal experiments, aureomycin was shown to be very effective in the treatment of infections due to Rickettsiae[83,84] and the lymphogranuloma-psittacosis group of viruses[85]. These experiments included psittacosis, lymphogranuloma venereum, spotted fever, typhus fever, scrub typhus, rickettsial and Q fever. In this work, there appeared to be a quantitative relationship between the size of inoculum of the infectious agent and the dosage and time of administration of aureomycin. With early treatment of experimental infections produced by small doses of infectious material, the animals were fully protected but were not always immune to rechallenge. However, when massive infectious doses were administered, and animals treated with aureomycin, immunity to challenge was established. Many, however, were not sterilized, and persisted as carriers. Tests against the viruses of influenza B, canine distemper, rabies, Newcastle disease, Venezuelan equine encephalitis, and MEF-1 strain of poliomyelitis showed no activity[88].

TABLE 3. IN VITRO SUSCEPTIBILITY OF CLOSTRIDIA TO AUREOMYCIN, PENICILLIN, AND CHLOROMYCETIN

Organism	Microgram/milliliter inhibiting growth Aureomycin	Penicillin	Chloromycetin
Cl. tetani	0.16	0.02 (0.14 units)	2.5
Cl. perfringens (*welchii*)	0.02	0.08 (0.56 units)	2.5
Cl. septicum	0.02	0.005 (0.035 units)	2.5
Cl. chauvoei	0.01	0.02 (0.14 units)	2.5

In experiments using chick embryos infected with psittacosis virus, aureomycin was three times as effective as chloromycetin on a weight basis, and more than five times as effective on a molecular basis[86].

Bacterial

In experiments against bacterial infections, good protection was shown against *Eberthella typhosa* in mice, *Pasteurella multocida* and *Erysipelothrix rhusiopathiae* in chicks, but the drug was less effective against *Salmonella gallinarum*[86]. Aureomycin in multiple doses protected mice against infections with pneumococcus type I, *Streptococcus hemolyticus* B and *Klebsiella pneumoniae*[8].

In experimental tularemia in mice, in which species the disease causes 100% mortality, there was a "striking suppressive effect" following the oral or subcutaneous administration of aureomycin[24].

In mice infected with more than 100 $l.d._{50}$ of *Bacillus anthracis*, 100% of the animals were protected by aureomycin at a dosage of 10 mg. per kg., intraperitoneally, in one dose daily for seven days, even when treatment was delayed 24 hours after infection.

Spirochetal

Aureomycin was found to be effective in the treatment of experimental relapsing fever in Syrian hamsters and *Leptospira icterohemorrhagiae* in mice[12]. In experiments using both hamsters and dogs, *L. canicola* carriers were freed of infection following the administration of aureomycin. Kidney material of the hamsters was examined and cultured, and was negative; when adequate dosage was administered, urine of treated dogs was also negative[19].

Miscellaneous

In experimental peritonitis in dogs, 90% of those treated with aureomycin survived as compared with only 60% of the streptomycin-treated and 20% of the control dogs[87]. Culture studies of peritoneal exudate were made immediately after death; surviving dogs were

sacrificed after 14 days and culture studies made. In all animals, *Escherichia coli* predominated, but in eight of the ten aureomycin-treated dogs, various species of Proteus were found.

Clinical Results in Humans

A considerable clinical experience has been accumulated in human medicine, as evidenced by a bibliography of more than 500 papers. Aureomycin has been used successfully in the treatment of lymphogranuloma venereum, Q fever, and ocular infections due to staphylococci, pneumococci, influenza, and inclusion conjunctivitis. It is particularly effective against typhus, Rocky Mountain spotted fever, and primary atypical pneumonia. As a usual occurrence, response to treatment with aureomycin was prompt, with disappearance of fever in 48 to 72 hours from the start of treatment. Results in the treatment of pneumococcal and streptococcal pneumonias have been comparable to those following penicillin therapy. In staphylococcal and Klebsiella pneumonias, aureomycin is the treatment of choice. Temperatures usually reached normal levels in 12 to 36 hours, and there was rapid resolution of the pneumonic process in most cases. Recently, reports of the effectiveness of aureomycin in the treatment of syphillis have appeared.

Of particular importance are the reports of the effectiveness of aureomycin in the treatment of acute brucellosis due to *Brucella abortus, Br. melitensis,* and *Br. suis.* There was prompt cessation of symptoms in patients, although some had previously failed to respond to combined streptomycin-sulfadiazine therapy.

TABLE 4. IN VITRO SUSCEPTIBILITY OF ORGANISMS ISOLATED FROM HUMAN BEINGS TO AUREOMYCIN, CHLOROMYCETIN, PENICILLIN, AND STREPTOMYCIN

Organism	No. strains	Microgram/milliliter completely inhibiting growth			
		Aureomycin	Chloromycetin	Penicillin	Streptomycin
Staph. albus (22,23)	6	0.39-0.78	12.5->25	0.016-0.097	2.0-31.2
	5	6.25-25.0	6.25-25.0	12.5->25	1.95->250
Staph. aureus (22, 23, 24)	38	0.03-0.78	5.0-25.0	0.006-1.0	0.3-62.5
		>25*		>25**	
Str. spp. (22, 23)	27	0.097-1.25	1.56-12.5	0.006-6.25	0.24-50.0
					100,* 250*
Aerobacter spp. (22, 23)	10	1.95-15.6	5.0-62.5	31.2->250	1.95->250
Brucella spp. (22, 25)	47	0.048-1.5	1.56-6.25	0.78**	1.2-2.5
E. coli (22)	14	0.48-3.9	3.9-15.6	31.2-62.5	7.8-62.5
		15.6*	62.5*		
Br. tularense (26)	—	0.5			
Sal. choleraesuis (22)	1	15.6	31.2	62.5	125.0
Sal. typhimurium (22)	1	3.9	7.8	7.8	62.5
Sal. typhosa (22)	10	0.97-1.95	7.8	3.9-62.5	15.6-125.0
P. vulgaris Proteus spp. (22, 23, 27)	23	<0.012-250.0	2.5-125.0	1.95->250.0	3.12->250.0
Pseudomonas sp. *Ps. aeruginosa* ((22, 23, 27)	18	0.4-100.0	25.0->250.0	250.0	25.0- 250.0
		>200.0*			

*1 strain — **2 strains

There was a recurrence of fever and positive blood culture in a few, but these responded well to retreatment. Patients were usually afebrile in two to four days, and in only one case did fever persist longer than five days after treatment was begun. Results in the treatment of chronic brucellosis are equivocal. In one case of two years' duration, there was no alteration of symptoms. There was marked and immediate improvement in a case of four years' duration, but two weeks following the termination of treatment, low grade fever recurred. In the treatment of 110 culturally negative patients, there was partial to complete recovery in approximately 45%, which had been observed for one to six months following therapy.

To date, the treatment of leptospirosis in only one critically ill patient has been reported. Agglutinins for both *L. canicola* and *L. icterohemorrhagiae* were present in titers greater than 1:10,000. Treatment with aureomycin was administered from the sixth to the seventeenth day of illness, and there was prompt clinical improvement, blood urea declined, and liver function returned to normal.

In the treatment of tularemia, excellent results were obtained, especially in cases complicated by pneumonia. Good response to aureomycin therapy was obtained in the treatment of psittacosis. Pyoderma and erysipelas appear to respond favorably. In the treatment of anthrax, patients became afebrile in three days and local edema disappeared in one to two weeks after oral administration of aureomycin.

The results of therapy of urinary tract infections have compared favorably with other agents. Many infections due to *E. coli, A. aerogenes, S. fecalis, S. viridans, Ps. aeruginosa, B. proteus,* which did not respond to therapy with sulfonamides and other antibiotics, were successfully treated with aureomycin. In some cases, where severe anatomical anomalies existed, improvement was temporary. To date, in typhoid and Salmonella infections, results have not been as favorable.

Negative stools were obtained three days after start of treatment of amebiasis.

Various infections produced by staphylococci have been successfully treated with aureomycin, including staphylococcal bacteremias and meningitis. Many were treated late in the infection, after they had failed to respond to therapy with sulfonamides, penicillin, and streptomycin.

Considerable success has followed the use of aureomycin in the treatment of acute localized peritonitis, spreading peritonitis with no surgery, in preoperative preparation of patients for gastric surgery, and postoperative treatment of such conditions.

Because, in addition to its activity in viral and rickettsial infections, aureomycin, in itself, parallels the combined effects of penicillin, streptomycin, and the sulfonamides, and because the problem of bacterial resistance to aureomycin is nonexistent, it is rapidly replacing the use of these drugs in the treatment of coccal and bacillary infections, with the exception of tuberculosis. However, it has been pointed out that, in all antibiotic therapy, it must be stressed that it is necessary to exercise the best judgment possible in cases under treatment, as the classic clinical picture is usually masked[28]. Limitations of the sulfonamides and antibiotics must be understood in order to avoid irrevocable changes. Dependence entirely on the drug, to the exclusion of established treatment principles, must be avoided. While antibiotics are of inestimable value in the treatment of disease, their successful use depends upon a sound knowledge of both their advantages and limitations.

Use in Veterinary Practice

The excellent results obtained both in experimental animals and in human clinical cases has stimulated an intense interest in the possibilities of the use of aureomycin in the field of veterinary medicine. Investigations are under way in many laboratories and veterinary clinics throughout the country. The usefulness of aureomycin has been established in streptococcal and staphylococcal mastitis. Data are being accumulated as to its effectiveness against a wide variety of diseases. The experimental data to date suggest that this will be found as useful in veterinary medicine as it has in human medicine.

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CONSUMPTION OF DAIRY PRODUCTS

PRODUCT	POUNDS PER PERSON		
	1925-29 AV.	1935-39 AV.	1949
CHEESE	4.5	5.5	7.2
BUTTER	17.8	16.7	10.6
ICE CREAM	9.4	9.5	16.3
EVAP. MILK	9.8	15.0	17.7
FLUID MILK AND CREAM	348	340	382

U. S. DEPARTMENT OF AGRICULTURE — BUR. 47580-50 — BUREAU OF AGRICULTURAL ECONOMICS

Occurrence Of The Ear Mite, *Raillietia Auris* (Leidy, 1872), Of Cattle In Colorado

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FROM a yearling Hereford heifer examined post mortem at the Veterinary Clinic, School of Veterinary Medicine, Colorado A. & M. College, ten female mites identified as *Raillietia auris* (Leidy, 1872) Trouessart, 1902, were obtained from the bulla tympanica. Insofar as the writers are able to ascertain, no reports of their occurrence in this country have appeared subsequent to that of Leidy. It is the purpose of this paper, therefore, to report the observations of these mites, together with clinical symptoms caused by their presence in the ears of cattle, both from our case and those reported in the literature.

Leidy[5] identified as *Gamasus sp.* some large mites which he received from Dr. C. S. Turnbull, who collected them from an ox. Later, on information from Turnbull, who pointed out that Leidy had misunderstood him regarding the location of the mites as he himself had seen the steer slaughtered and was certain they came from the ears, Leidy[6] restudied the mites, and recognized them as being an undescribed species for which he proposed the name *Gamasus auris.*

Osborn[7] considered *G. auris* as uncommon because he had seen no reports of them in the American literature subsequent to Leidy's papers. Trouessart,[8,9] working in France, erected the genus Raillietia to which he transferred *G. auris* as the type species. The proper name is *Raillietia auris* (Leidy, 1872) Trouessart, 1902, and not *R. auris* Trouessart, 1902, as stated by Freund,[3] who apparently overlooked Leidy's[6] second paper.

Freund[3] reviewed the veterinary literature on *Raillietia auris* in cattle. All reports of the occurrence of this mite stated that they were found in the external canal of the ear. As many as 40 to 50 specimens have been removed from a single ear. The symptoms of the infection were said to cause great distress to the infected animals. Freund[3] reported some of the symptoms that had been recorded by various European workers. According to him, Schoemacker, in 1887, stated cattle became frenzied; Ostertag, in 1890, had seen an infected cow stand in one place shaking her head continuously for an hour at a time; and Kitt, in 1906, said the presence of the mites in the external ear canal were so annoying as to cause infected animals to become raving mad.

Upon examination of the external ear canal of infected cattle by means of speculum, Freund[3] observed a purulent layer mixed with a greasy substance and containing many small mites the size of a millet seed. He found infections usually were bilateral.

Freund[3,4] pointed out that although the mites had been known since 1872, it was not until 1902 that Trouessart was able to collect sufficient material to make a careful morphological study, thus indicating their rarity. Much information[4] is lacking regarding these mites, such as the extent to which cattle are infected, the numbers that occur in the ear, and how many must be present and under what conditions they produce an otitis. They may possibly have altitudinal preferences.

The Hereford heifer from which the mites reported in this paper were obtained was raised at Limon, Colo., which is on the plains about 90 miles southeast of Denver. She was one of 91 animals purchased in the Denver stockyards July 6, 1949 and shipped to feed lots at Windsor, about 60 miles north of Denver.

Clinical Symptoms: Upon arrival of the cattle at the feed lot, this heifer was observed to be carrying her head in an extended position and turned to one side, indicating distress. On July 26 she was brought to the veterinary hospital and kept under observation until August 1, when she was destroyed and a post-mortem examination made.

The characteristic symptoms exhibited by this animal were, as stated above, the position in which she carried her head and the evidences of distress. The head was held in an extended position and twisted to one side continuously so that the affected ear was down, giving the impression that she was listening to something on the ground. Other symptoms were anorexia and emaciation. Upon arrival at the hospital her temperature was normal

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(101.4 F.). The differential blood count was 7,440,000 erythrocytes and 7,200 leukocytes, both of which are normal for this area.

Autopsy Findings: The external auditory meatus was normal in appearance except for an excessive amount of cerumenal exudate. No inflammatory reaction was observed. When the bulla tympanica was opened, however, a number of large mites were observed. They were whitish in color with high arched bodies

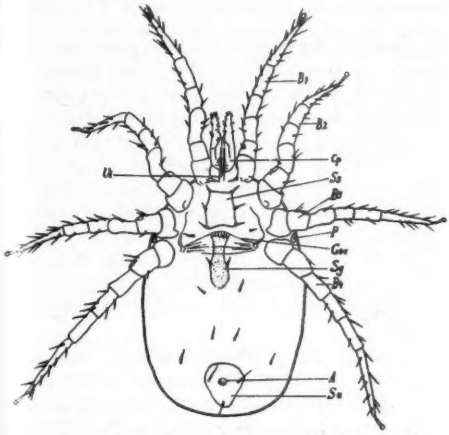

Fig. 1. Ventral view of female Raillietia auris (Leidy, 1872). After Freund, 1910.

A-anal opening, B-1-4 legs, Cp-capitulum, Goegenital opening, P-peritrema, Sa-anal plate, Sggenital plate, Ss- sternal plate, Ul-mentum. Capitulum and pulvilli sketched.

about 1 mm. in length. The portal of entry must have been through the tympanum although no opening in it nor injury to it was observed.

Only females were found in our material. Freund[3] stated that the material studied by Trouessart, which was collected during the period from March to the end of June, contained egg-bearing females, six-legged larvae, and eggs; one male was found in the specimens collected in March. Later Trouessart apparently had numerous males as he was able to make morphological studies of them without commenting on a shortage[8]. Freund's[3] material, collected during October and November, contained many egg- and larvae-bearing females (Fig. 1) and almost as many males (Fig. 2). He[3] stated there were no free-living larvae. On one occasion, however, a single larva was found which he assumed issued from a crushed adult female. Trouessart[10] also reported *R. auris* as being parthenogenetic. Banks,[1] however, believed that he was probably in error because previously supposed cases of parthenogenesis (in mites) have been shown to be errors.

The only other known species of this genus is *R. hopkinsi* Bradford, 1939,[2] from the ears of the water buck (*Kobus defossa ugandae* Neumann) from Africa. Although apparently of rare occurrence, *Raillietia auris* is a parasite of great economic importance in the cases where it has been observed both in this and European countries.

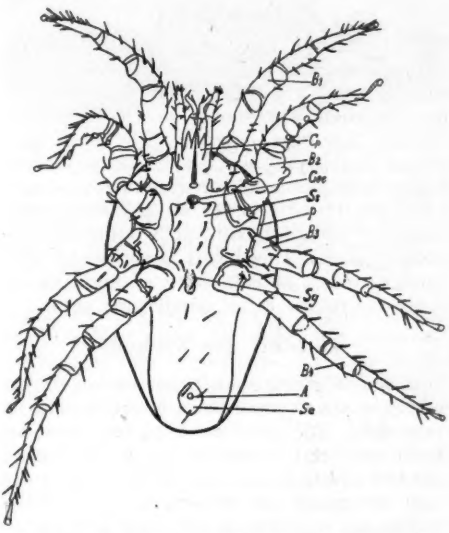

Fig. 2. Ventral view of male Raillietia auris (Leidy, 1872). After Freund, 1910.

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Further Studies On *In Vitro* Cultivated Pneumoencephalitis (Newcastle Disease) Virus And Its Use As A Vaccine

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THE relative ease of propagating pneumoencephalitis (Newcastle disease) virus *in vitro*, using a modified Simm Sanders medium prepared with bovine or chicken ultrafiltrates, has been reported[1]. The virus employed in initiating the tissue culture was the highly pathogenic and hemagglutinative strain, California 11914 (Nap I) which showed some tendency toward modification following ten serial passages. This report is concerned with further studies of cultivation of the virus *in vitro* and its use as an immunizing agent.

Materials and Methods

In the following studies, no changes, unless otherwise stated, were made in the method of procedure. The medium employed over the liver and heart tissues of ten to 13-day-old chicken embryos was composed of either bovine or chicken ultrafiltrate, in a 20% concentration in Simm Sanders salt solution. It was found, however, that the virus could be propagated as easily in a medium containing minced whole embryos in place of the liver and heart tissues. The materials and methods employed in virus titrations and viability tests, as well as the apparatus used for atomizing the virus suspensions have been described[2,3].

Virulence of the Virus

In vitro propagated virus following serial passage through media prepared with bovine ultrafiltrate showed a definite reduction in its virulence for chickens. (Table I.) After each serial passage, except as indicated in the table, the virus was tested for viability and virulence by injecting intramuscularly 0.5 ml. of the undiluted culture into each of two chickens. The age of the birds ranged from 22 to 81 days. The virus propagated in bovine ultrafiltrate through the tenth and the 20th serial passages proved to be fatal to 33% of the chickens injected. The cultured virus of the 31st to the 40th passages was fatal to 5%, whereas the virus of the 41st to the 50th passages, produced no mortality. In the latter group no symptoms of the disease were evident but HI antibodies were found in the blood stream by the eighth day and the chickens were refractory to a challenge dose of $2x10^5$ m.i.d. of virulent virus. The *in vitro* propagated virus remained virulent for chicken embryos and the embryo titers of the tissue cultures ranged from 10^{-8} to 10^{-7}. Similar results were obtained with virus propagated in tissue culture medium prepared with chicken ultrafiltrate. (Table I.)

Although the artificially cultured virus produced no deaths in birds several weeks old it was of interest to determine the effect of the virus for chicks. Sixty chicks, two days of age, were divided into three groups of 20 each. Each bird of group I was inoculated intramuscularly with 0.25 ml. of undiluted tissue culture Bov P50,† group II chicks received 0.25 ml. of the culture diluted 10^{-3} whereas group III was held as uninoculated controls. The mortality due to the virus in groups I and II was three (15%) and seven (35%) chicks, respectively. HI tests made on the ninth day upon eight chicks of each group showed that not all of the inoculated chicks had developed antibodies in their blood. However, all chicks but one were refractory to a challenge dose of $2x10^5$ m.i.d. of virulent virus. On the 16th day the remaining birds in groups I and II were tested in the same manner with similar results. It is apparent, therefore, that the tissue cultured virus which showed a marked reduction in virulence for chickens 22 to 81 days of age was capable, when given intramuscularly to two-day-old chicks, of producing a significant mortality. HI antibodies were absent in 23.3% of the surviving chicks when tested on the ninth or 16th day post-inoculation, but only 10% of the birds were susceptible to a challenge dose of virulent virus. A immunity, therefore, was found in some

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†Culture passed through 50 serial passages i Simm Sanders medium prepared with ultrafiltrat of bovine blood serum.

the chicks which showed no antibodies in the blood stream as determined by the hemagglutination inhibition (HI) test.

Vaccination Trials

Laboratory Trials: The use of *in vitro* propagated virus for immunization of chickens had been considered for some time; however the mortality observed following intramuscular inoculation of chicks, suggested to the writer that a different route of administration should be tried. Inasmuch as the virus can be transmitted by the air-borne route, it was thought worthy of trial as a means of vaccination. The method, if successful, would have the advantage that a large number of chickens could be exposed at one time with a minimum of handling.

Table II shows the results of four separate trials of exposing chickens to an atmosphere of virus droplet nuclei produced with tissue cultures. The apparatus employed for air-borne studies was described in detail in another paper,[3] and the parts used in these experiments are shown in fig. 1. When large numbers of chicks were exposed, as in trial IV, a home constructed, forced draft, upright incubator with a capacity of 24 cu. ft. was used. The undiluted tissue culture was atomized in a Well's type reflux atomizer into an air stream flowing at the rate of 24 to 28 liters/min. The virus cloud was introduced into a section of the incubator above the egg compartment, and by means of a fan the cloud was carried along the side of the box and into the egg compartment through baffles. The chicks were divided into four groups and shelved in various parts of the incubator.

No symptoms of pneumoencephalitis were

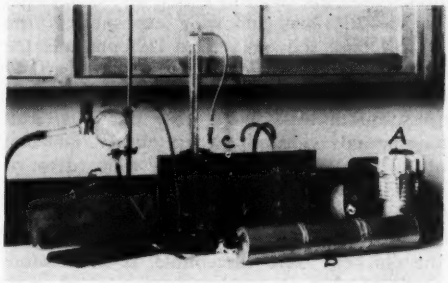

Fig. 1. Apparatus employed for atomizing in vitro propagated pneumoencephalitis (Newcastle disease) virus. Motor (A) drives the air through glass wool filter (B) into control panel (C). The regulated air streams are passed through Well's reflux atomizer containing the virus suspension (D) and forced through tube (E) into exposure chamber.

evident in any of the birds exposed to the virus droplet nuclei for one hour; however, control chickens exposed for the same length of time to the original virus (Nap I) developed typical symptoms of the disease which in two instances proved fatal. (Trial III.) HI antibodies were found on the eighth day in the blood of most of the chickens exposed to the artificially cultured virus. The titers were generally lower than one would have anticipated had a fully virulent virus been used. No HI antibodies were demonstrated in the blood

TABLE I. REDUCTION OF VIRULENCE OF IN VITRO PROPAGATED PE VIRUS BY SERIAL PASSAGE THROUGH SIMM SANDERS MEDIA PREPARED WITH BOVINE AND CHICKEN BLOOD ULTRAFILTRATES.

Passage	Ultra-filtrate in media	Embryo titre range	Chickens inoculated I. M. with 0.5 ml. culture[1] HI titre[2] Day	HI titre[2] Range	Age Days	No. and percent died	No. refract	Total no. tested	Remarks
10 to 20	Bov.	10^{-4} to 10^{-7}	8 to 10	20-320 or >	26-47	4 or 33%	8	12	No test on passage no. 11, 16, 17, 18 & 19
	Chick	10^{-3} to 10^{-5}	8 to 10	40-320	26-67	1 or 14.3%	7	8	
21 to 30	Bov.	10^{-4} to 10^{-5}	8 to 15	20-320 or >	26-83	4 or 22%	14	18	No test on passage no. 30
	Chick	10^{-3} to 10^{-4}	8 to 15	10-320 or >	26-83	8 or 40%	12	20	
31 to 40	Bov.	10^{-4} to 10^{-6}	9 to 12	20-320 or >	40-74	1 or 5%	19	20	
	Chick	10^{-4} to 10^{-6}	9 to 12	20-320 or >	40-74	0	18	18	No test on passage no. 31
41 to 50	Bov.	10^{-4} to 10^{-6}	11-13	80-320 or >	22-81	0	20	20	
	Chick	10^{-4} to 10^{-6}	10-13	0-320 or >	22-81	2 or 10%	18	20	

[1] I. M. = Intramuscularly.
[2] HI = Hemagglutination inhibition.

of three chickens bled on the eighth or ninth day following exposure although the birds were solidly immune to a lethal dose of virulent virus. Similar results were found in a group of 22 chickens (trial IV) bled and challenged on the 26th day following exposure. If the HI response shown in table II represents the highest level attained by each bird, then 47 or 70.1% of the chickens would be expected to succumb to a lethal dose of virus. This assumption is based on the observation that all or most of the chickens with titers of 1/40 or less when tested by the procedure employed would be susceptible to $2x10^5$ m.i.d. of strain C virus[5]. Actually only 20.9% of the chickens were susceptible. It is therefore apparent that the *in vitro* propagated virus administered by the air-borne route may produce a solid immunity without uniformly inducing the development of HI antibodies or that the blood titers if they occurred, had receded after reaching their highest level. Sufficient data in these trials are not available to determine whether the behavior of the HI antibody response parallels the results obtained by Doll, *et al.*,[6] with a strain of Newcastle disease virus of low virulence.

Field Trials: Two field trials of immunizing young chickens with the *in vitro* propagated pneumoencephalitis virus administered as droplet nuclei were made on a broiler plant. The trials were conducted in a single long brooder house which was divided into eight separate pens by solid board partitions. There was no history of disease on the premises during the past year and HI tests on ten birds from each pen showed no evidence of inhibiting virus hemagglutination.

1. The first trial was made upon a group of 606 broilers, nine days of age. The experiment was carried out in the pen at one end of the house and to reduce the possibility of spreading the virus, the adjacent pen was emptied and cleaned. The third pen and all others, however, contained chicks which ranged from three days to five weeks of age. One pen of chicks, three days of age, closest to the experimental pen, were treated as uninoculated controls.

The chicks were driven or forced under a hover type brooder and the space between the floor and the outside walls of the brooder was closed with feed sacks in order to confine the birds and to reduce dilution of the atomized virus with outside air. The tube leading from the Well's reflux atomizer was intro-

TABLE II. EXPOSURE OF CHICKENS TO ATOMIZED IN VITRO PROPAGATED PE VIRUS UNDER LABORATORY CONDITIONS

Trial No.	Tissue Culture Passage	Tissue Culture Emb. Titre	Experimental Chicks No.	Experimental Chicks Age	Exposure to Atomized Virus[6]	Symptoms	H. I. Test p.v.d.[1]	H. I. Test Titre	Challenge[2]	Remarks
I	Bov.[5] 16 undil		2	5 wks.	1 hour	0	8	2-0	2R	
	Nap I Dil. 10^{-1}	10^{-7}	2	5 wks.	1 hour	+	8		2R	
II	Bov. 50	10^{-5}	2	7 wks.	1 hour	0	8	2-80	2R	
	Nap I Dil. 10^{-1}	10^{-7}	2	7 wks.	1 hour	+	8	1-80 1-320	2R	
III	Bov. 53	10^{-5}	15	30 da.	1 hour	0	9	1-0 6-10 to 40 8-80 or >	15R	
	Nap I Dil. 10^{-1}	10^{-7}	4	30 da.	1 hour	+ 2 died	9	2-320	2R	
IV	Bov. 50A	10^{-6}	50	11 da.	1 hour	0	10	15-10 to 40 1-80	3S 13R	15S chicks of same hatch placed in incubator as contacts on 13th p.v.d. All negative for HIA[4] on 23rd p.v.d. All negative for HIA and S to challenge 26 p.v.d.
							13	5-10 5-80 or >	3S 7R	
							26[3]	13-0 5-10 to 40 4-160 or >	8S 14R	

[1] p.v.d. — post vaccination day.
[2] Each chicken inoculated I. M. with $2x10^5$ mid of virulent virus (Strain C.). R = refractory, S = Susceptible.
[3] Two chicks escaped from incubator into room during experiment and were discarded.
[4] HIA—hemagglutination-inhibition antibodies in blood.
[5] Bov.—the tissue culture media was prepared with bovine ultrafiltrate.
[6] The infectiveness or activity of each suspension employed proved by inoculation of each of two chickens I. M. with suspension in atomizer at end of exposure period.

duced into one of the vents at the top of the brooder and the stream of virus-laden air was injected into the confined area over the birds' heads at the rate of 18 liters/min. for 60 minutes. Approximately 30 cc. of the culture were expended during this period.

There was no evidence of pneumoencephalitis in the vaccinated group of chicks until the 14th post-vaccination date (p.v.d.) when one chick was found dead and a few others presented symptoms of torticollis. By the 17th p.v.d., a total of seven birds presented nervous symptoms; five birds suffered from torticollis, one chick showed leg paralysis and one chick developed tremors of the head. No additional mortality or symptoms were noted up to the 13th week when the birds were marketed. (Table III.) Blood samples taken on the tenth and 24th p.v.d. presented HI antibodies in the blood. Titers of 1/80 to 1/320 or more were found in the ten chicks bled on the tenth p.v.d. but varied from 0 to 1/160 in 20 chicks bled on the 24th p.v.d. In the latter group 12 birds presented an HI titer of 0 or 1/10. Ten of the group of 20 chickens bled on the 24th p.v.d. were challenged with 2×10^5 m.i.d. of virulent virus; seven birds were refractory and three were susceptible to the virus. One possible reason for the inconsistency of immunity was that it was difficult to keep the birds confined under the brooder during the exposure period and many chicks were found in the sacking. It was possible that some of the chicks in the sacking were inhaling outside air and did not receive a sufficient amount of virus with this method of administration.

The high HI titers which were obtained on the tenth p.v.d. and the marked decrease found by the 24th p.v.d. in chickens taken at random may indicate that the HI titers were receding after reaching their highest level between the tenth and the 24th days.

There was no evidence of spread of the disease to the controls or other pens in the house.

2. In the second trial, two groups of chicks were exposed to the virus. From the first group, consisting of 610 broilers three days of age, 25 birds were removed from the flock prior to exposure, painted with picric acid and withheld for 24 hours before returning them to the flock as contact controls. The second group of 705 chicks was made up of white leghorn females 18 days of age. Sixty-four chicks of this group were withheld from exposure to the virus but they were replaced immediately following vaccination of their pen mates. Both groups were exposed to the 55th serially passed *in vitro* pneumoencephalitis

TABLE III. RESULTS OF EXPOSING 3 FLOCKS OF BROILERS TO ATOMIZED IN VITRO PROPAGATED VIRUS

Trial	Group	No. chicks & Age	Exposure	HI Titer and Results to Challenge — 1st Test p.v.d.	1st Test HI Titer[3]	2nd Test p.v.d.	2nd Test HI Titer	2nd Test Challenge[4]	3rd Test p.v.d.	3rd Test HI Titer	3rd Test Challenge	Remarks
I	Vacc.	606 8 da.	60 min. to Bov. P50[1]	10	0-320 ave-80	24	0-320 ave-36	7 refr. 3 susc.				No mortality 7 Chicks with nervous symptoms
	Controls	500 3 da.		10	0	24	0	All (6) susc.				
II	Vacc.	560 3 da.	75 min. to T.E. Bov. P55[2]	8	0-320 ave-58	17	40-320 ave-140	All (4) refr.	47	0-320 ave-63	All (2) refr.	Mortality— 37 chicks or 6.6% 10 with permanent nervous involvement
	Controls	50 3 da.		8	0	17	0	All (4) susc.	47	0	All (2) susc.	
III	Vacc.	629 18 da.	15 min. to T.E. Bov. P55[2]	8	0-320 or ave-118	17	20-160 ave-60	All (4) refr.	47	0-320 ave-113	All (2) refr.	No mortality 6 chicks with permanent nervous involvement
	Controls	64 18 da.		8	0	17	0	All (4) susc.	47	0	All (2) susc.	

[1] Tissue cultures of the 50th serial passage through medium prepared with bovine ultrafiltrate.
[2] Tissue cultures of the 55th serial passage through medium prepared with bovine ultrafiltrate and using whole embryos in the media.
[3] Range and average titer of samples tested.
[4] 2×10^5 mid of virulent PE virus (Strain C).

virus propagated in a medium prepared with bovine ultrafiltrate and minced whole embryos. The embryo titer of the artificially cultured virus was 10^{-6}. The period of exposure to the virus cloud was 75 minutes and 15 minutes, respectively. The amount of tissue cultured virus required for the exposure was approximately 35 cc. per hour.

To eliminate the lack of uniformity of exposure to the virus, the birds were placed into a specially constructed exposure chamber. (Fig. 2.) The latter consisted of an air-tight

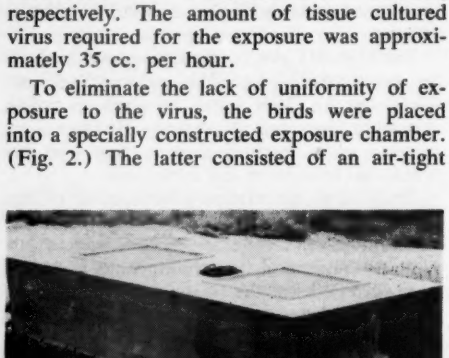

Fig. 2. Plywood box used for exposing chicks with atomized in vitro propagated pneumoencephalitis (Newcastle disease) virus in the field.

plywood box 8x4x1.7 feet. One side of the box was removable for loading and unloading the chicks and two large glass windows were placed in the roof to give sufficient light. A hole in one end of the box served as an intake for the atomized culture and another hole on the opposite end as an exit for the escaping air. It was found that the three-day-old chicks were comfortable and active during the exposure period whereas 15 minutes was the maximum period the 18-day-old birds would tolerate confinement in the box with an air stream of 25 liters per minute.

The results of these two trials are summarized in table III. No respiratory symptoms were noted in the group exposed for 75 minutes but by the fourth p.v.d. the owner noted that a few chicks were depressed and inappetent. By the eighth p.v.d. 15 chicks had died and an equal number showed definite symptoms of leg weakness. Pneumoencephalitis virus was isolated from the spleen and air sacs of three of the chicks showing nervous symptoms. Serum samples of ten vaccinated and an equal number of controls showed an average HI titer of 1/58 in the former but no inhibition of the virus with the latter. Leg weakness or torticollis was seen in ten chicks of the flock when examined on the 17 p.v.d., indicating that more chicks were developing nervous symptoms. A sporadic mortality continued for three weeks following vaccination but the flock, as a whole, appeared alert and active, and a total mortality of 37 chicks, or 6.60%, were sustained during this period. No further mortality nor evidence of other chicks with nervous symptoms were found. No effort was made to remove from the flock the chicks with a permanent nervous involvement and there was no evidence that the disease impaired their normal growth and development. HI tests and challenge with virulent virus of chickens from the vaccinated and contact control groups on the 17th and 47th p.v.d. indicated that the non-vaccinated chickens did not become infected from their pen mates. (Table III.)

The second group of chicks, exposed to the virus by the air-borne route for 15 minutes, presented no respiratory symptoms, and no mortality due to the disease was sustained in the flock duuring a 47 day post-vaccination observation period. A total of six chickens was counted that presented a slight torticollis but the condition did not impair their development. On the eighth p.v.d. two chicks were found in the group with symptoms of leg weakness and the virus was recovered from the pooled sample of the spleens and air sacs. HI tests on blood taken from the vaccinated and contact control chickens showed that the latter did not contract the disease from their pen mates or the surroundings during a 47-day period. The average HI titers of the vaccinated birds on eighth, 17th, and 47th p.v.d. were 1/118, 1/60 or greater and 1/113, respectively Chickens of each group challenged with $2x10^5$ m.i.d. of virulent virus showed that the vaccinated birds were immune but that the contact controls were susceptible.

Discussion and Summary

1 Serial passage of a virulent strain of pneumoencephalitis virus *in vitro* using Simm Sanders' medium was carried through 50 generations. The virulence of the artificially cultivated virus for chickens steadily decreased. Virus of the 40th to the 50th serial passages, when inoculated intramuscularly into each of two chickens in 0.5 ml. doses of the undiluted virus suspension, failed to produce symtoms or mortality in birds 22 to 81 days of age. The antigenicity of the virus, however, was maintained as indicated by the HI response and a solid immunity of the chickens to a challenge dose of $2x10^5$ m.i.d. of virulent virus.

2 The *in vitro* propagated virus remained virulent for chicken embryos and the 50th serial passage of the virus administered intra-

muscularly to two groups of chicks, 48 hours old, produced a mortality of 15 and 35%, respectively.

3 Preliminary laboratory studies have shown that immunity could be induced without development of symptoms through administration of the artificially cultivated virus by the air-borne route. There was no evidence in these trials to indicate that the chicks, or the environment of a closed incubator in which the experiment was conducted, were infectious to susceptible birds placed in the environs 13 days following exposure and kept there for a period of about two weeks.

4 The *in vitro* cultivated virus was used as an immunizing agent in three groups of birds comprising 1,795 chicks under field conditions. The following observations were made: (a) Although no respiratory symptoms were found in chickens exposed by the air-borne route to the *in vitro* propagated virus, nervous symptoms involving the legs, head and neck were seen in a limited number of birds. (b) The virus was isolated from the organs of symptomatic chicks eight days following exposure. (c) The highest mortality of 6.6%, and the largest number of birds with a permanent nervous system involvement was found in the youngest flock (three-day-old) which was exposed for 75 minutes to the virus-air stream. (d) No deaths resulted in two groups of chickens nine days and 18 days of age, exposed to the atomized virus for 60 minutes and 15 minutes, respectively; however, fewer chicks with nervous symptoms were found in the group which was exposed for the shorter period. (e) Susceptible chickens placed in contact with their vaccinated pen-mates 24 hours or immediately after exposure to the atomized virus showed no evidence of the disease during a 47-day observation and testing period.

Conclusion

Laboratory and field vaccination trials with a strain of pneumoencephalitis virus attenuated by artifical cultivation and administered by the air-borne route to chickens *en masse* produced results of a highly encouraging nature. In these trials, it was found that both the length of exposure to air-borne virus and the age of the chickens are important considerations. Further studies are needed before wide-spread field application can be recommended.

Acknowledgment

The author wishes to express his gratitude to Miss Ruth E. Johnston for her fine technical assistance.

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(*Continued from page* 310)

Serum Levels of Horses Following Intramuscular Injection of Aqueous Suspension of Procaine Penicillin

of 6 cc. produced acceptable serum levels having a duration of 48 to 60 hours. Doses of 9 cc. produced levels of similar duration having higher serum concentrations.

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A blood parasite, previously unreported in the United States, was isolated from an anaplasmosis carrier. This piroplasma organism has been identified as *Theileria mutans*. The parasite is usually regarded as being nonpathogenic; however, in rare instances, it may produce a pathological picture similar to east coast fever.—*E. J. Splitter, D.V.M.*

Some Clinical Uses Of A New Antihistamine

G. R. MOORE,* D.V.M., East Lansing, Michigan

IN veterinary circles, as in human medicine, during the past five or six years, considerable interest has centered around the various pathological manifestations of histamine, and their alleviation by various compounds, referred to collectively as antihistamines.

Mosier,[1] reported the successful use of antihistamine in bovine stomatitis and subsequently,[2] in bovine laminitis. Chavance,[3] presented a theoretical discussion of its use and reported its success in equine laminitis. Rawson,[4] gave an excellent discussion of the overall use of antihistamines and summarized the literature to date on their use in veterinary practice. He recommended their use in pulmonary edema, white scours in calves, overloaded rumen, urticaria, toxic indigestion, laminitis, tympanites, photosensitization, stomatitis, and anaphylaxis.

The purpose of this article is to report clinical trials on the use of a new antihistamine, dimethylaminoethoxy-methylbenzylpyridine succinate, (A. H. Solution—Jen-Sal).**

Toxicity

Since no clinic reports were available on the use of this product at the beginning of the trials, the first step was to test it for possible toxicity. A healthy grade cow weighing 750 lb. was given 16 cc. of a solution containing 11.3 mg. of dimethylaminoethoxy-methylbenzylpyridine succinate per cc. intravenously. Dosage was repeated at two-hour intervals until four doses had been given. Since no observable disturbance of pulse, temperature, respiration nor attitude were noted, the dosage was increased to 32 cc. or double that recommended by the manufacturer. After the third 32 cc. dose, the animal appeared slightly drowsy but exhibited no other outward effect.

Clinical Uses

Bovine Stomatitis: During the course of the trial use of the drug, three cases of bovine stomatitis were presented for treatment. The first two were simple cases of the ulcerative type probably due to plant allergy. Both cases responded promptly to a single intravenous injection of 1 cc. per 50 lb. of body weight. In the third, symptoms were persistent and chronic. Mouth lesions had been observed for three months before arrival at the hospital. Treatment was administered twice daily for six days, with no improvement. The animal was then destroyed and the pathologist reported typical lesions of aphthous stomatitis.

Calf Scours: Six cases of chronic scours in pail-fed calves were available for treatment. All had failed to respond to other accepted lines of therapy. Of these cases, two responded to a single injection, one improved and recovered after three daily treatments, and three failed to show any response to the drug.

Laminitis: Two cases were treated in horses, one cow, and two sheep, making a total of five cases. Improvement was effected in all by one or two intravenous injections except in one horse in which the condition had become chronic. In the two sheep, recovery was rather spectacular. Both were on their feet and much improved within a few hours following treatment.

Persistent Bloat: That histamine is a factor in bloat in ruminants has been recognized for some time. Cole, *et al.*,[5] reported that histamine injected experimentally produced bloat by paralyzing the rumen musculature. A. H. solution was employed in several cases of bloat in cattle. In some acute cases, supplemental therapy, such as the administration of rumenatorics, antiferments, and relief of the bloat by passage of a stomach tube were employed during the course of intravenous medication. Consequently, it was difficult to assess the value of the antihistamine. It appeared in some cases that rumen motility and rumination were re-established more promptly than was to be expected without the antihistamine treatment.

Four cases were treated in which moderate bloat accompanied indigestion and rumen stasis in cows on dry feed. Antihistamine therapy was of definite value in these cases in conjunction with laxatives and rumenatorics.

Three cases of persistent bloat in five to seven-month-old calves were relieved temporarily by a single intravenous injection of the drug, but repeated injections were necessary in two cases to control the bloat long enough for normal rumen digestion to become re-established.

*Professor of Surgery and Medicine, Michigan State College, East Lansing.

**Supplied by the Professional Service Division, Jensen-Salsbery Laboratories, Kansas City, Mo.

Retained Placenta: In those cases of retained fetal membranes, which were so firmly attached that they could not be removed for several days, antihistamine therapy was of value. Accompanying symptoms of depression, dullness, and inappetence were relieved almost immediately following intravenous administration of the drug.

Histamine is the degradation product of histidine (alpha amino acid) found in the course of protein fragmentation. It is formed abundantly in the decomposition of fetal membranes, and no doubt, there is considerable absorption from the endometral surfaces in these cases.

Respiratory Infections: Antihistamine was employed in ten cases of respiratory infections in cattle in conjunction with other standard treatment. Apparently it did these animals a lot of good. It temporarily allayed symptoms and assisted in restoring appetite.

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Bone marrow should be visualized as a definite organ about the size of the liver, although composed of many sections located throughout the bony framework of the body. It is one of the most important organs since it is the source of supply of all red cells, hemoglobin, granular cells, and platelets, and some of the lymphocytes and monocytes. Invasion of the bone marrow of a fractured long bone, such as the introduction of an intramedullary pin, embarrasses the function of only that portion of the system through which the pin passed, which dsyfunction is compensated by tissue of other bone.

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A shaped piece of aluminum sheet for the ear, applied with pressure bandage after draining a hematoma, will avoid a "cauliflower" ear.—*R. E. Ruggles, D.V.M.*

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When intramedullary pins are indicated to reduce fractures of long bones in dogs, best results follow their permanent insertion.—*R. J. Garbutt, D.V.M.*

2-Amino-5-Nitrothiazole in Enterohepatitis of Turkeys

In comparative trials with potential blackhead treatments at the Ontario Veterinary College, a thiometroimidine, Enheptin T, exhibited unusual promise[1]. There were no deaths among 49 poults maintained for 48 days on a ration containing 0.05% of this compound, notwithstanding artificial exposure to blackhead infection for the first 18 days. There were 24 deaths during this period in a group of 50 untreated controls, and losses from 23 to 37 birds in comparative groups maintained on eight other medicated rations. In the group in question, moreover, there were no symptoms either of disease or intoxication, no interference with eating or drinking, and no adverse effects on weight or rate of growth.

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Entomologists have hoped that benzene hexachloride (BHC) would be one of the residual-type insecticides that could be used satisfactorily in situations where houseflies have developed resistance to DDT. Results obtained in experimental work in Egypt (*Sci.*, 111:651 [June 16] 1950) indicate that any benefit derived from a change to this insecticide might be only temporary, as controlled experimental work and field observations have demonstrated that a degree of resistance was acquired by flies after continued applications of BHC to breeding places in an area control project.

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Due to changes in eating habits, increased per capita consumption of fluid milk, eggs, meat, and vegetables has resulted in a 20 to 40% increase in demand for most of these items.—*Agr. Sit.*, May 1950.

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Consideration of water consumption is of prime importance when using medicants in the drinking water of chickens and poults.—*B. S. Pomeroy, D.V.M.*

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Acute intoxication following ingestion of DDT causes nervous disorders, and chronic intoxication results in fatty degeneration and necrosis of the liver.

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[1]McGregor, J. K., Observations on the Prophylactic Value of Certain Drugs for Enterohepatitis Infection (Blackhead) in Turkeys. *Can. Jour. Comp. Med.*, 13:257, 1949.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

The best insurance against tuberculosis is a program of annual replacements with day-old chicks from disease-free flocks. All laying birds should be sold at the end of their first laying year in this program.

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A correspondent wrote us asking our opinion about a cow having bilateral swellings a short distance ventral to the angles of the ilium, and also stated that one eyeball appeared very prominent. The animal had malaise, and pale mucous membranes. The diagnosis was leukemia or pseudoleukemia.

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During the veterinary conference held at Kansas State College, June 2-3, one practitioner stated that in range country a method of controlling a cow's hind limbs during obturator paralysis, the latter a sequel of dystocia, is to place the limbs in post holes so that the ventral surface of the animal's body rests on well-bedded ground.

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Veterinarians have told us that occasionally they are asked to explain the causes of repeated farrowing of small litters in sows in which no in-breeding has been practiced and where adequate rations have been fed. Our reactions to this problem are as follows:

1. A sow is usually in heat for about three days and ova are released during all of this time, or in other words, there is a maximum number of available ova at the close of the heat period. Breeding at the beginning of the heat period fertilizes only the few ova there are present, and towards the close of the heat period the sperms deposited at the beginning have become so devitalized that they are no longer able to fertilize the now abundant ova. Therefore, breed sows towards the close of the estrus cycle, rather than at the beginning of this period.

2. If sows do not receive a balanced ration, such as corn alone with an inadequate amount of protein, during the gestation period, the litters are likely to be small.

3. Both sows and boars can inherit the tendency to beget small litters.

When the usual estrogenic nervous stimulation of heat in cows is absent (silent heat), physical signs of it may be stimulated by the administration of a therapeutic dose of pregnant mare serum.

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General veterinary practitioners, and those specializing in the handling of pet animals are well aware of the fact that the repeated administration of sodium iodide to entire males as in the treatment of actinomycosis, or the use of heartworm remedies in dogs has a definite devitalizing effect on the animal's sperms. These become distorted and almost lifeless. In the course of time, after the use of the remedy is discontinued, sperm of normal vigor and vitality are again elaborated.

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Excessive liming of certain soils, especially those derived from acid igneous rocks, decreases the solubility of soil cobalt so that this element thus becomes less available for assimilation by dairy cows and sheep. General symptoms in such cobalt-deficiency diseases are emaciation, pica, anemia, retarded sexual development, harshness of wool, etc. Good soils from the standpoint of animal health should contain about two parts of cobalt in one million parts of soil or about four pounds to the acre. Usually grasses contain less cobalt than legumes.

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In the report of the Committee on Chemicals Introduced in Foods, as printed in the 1949-1950 Year Book of the American Public Health Association, it is stated, among other things, that "studies have shown that the application of DDT to alfalfa, for the control of insects, gives a higher yield and a higher content of carotene, but at the same time the alfalfa was also found to contain DDT. When fed to animals this contaminated alfalfa led to the presence of DDT in the eggs and flesh of chickens, in the milk and beef of cows, and in the meat of lambs." Foods treated with benzene hexachloride and chlordane have produced brain lesions and parenchymatous degeneration of the liver and spleen in experimental animals.

EDITORIAL COMMENTS

Federal Grade Stamp on Uninspected Poultry and Rabbits No Assurance of Wholesomeness

On January 1, 1950, the regulations of the Production and Marketing Administration (PMA) of the United States Department of Agriculture, dealing with the grading and/or inspection of poultry and rabbits became effective. Prior to the enactment of these regulations, several meetings were held in various cities for the purpose of discussing and entertaining suggestions regarding the proposed regulations. Public health agencies offered opposition based on the fact that the program as outlined would give consumers a false sense of security and tend to create confusion. Public health implications were not considered, as the proponents of the plan continued to bring pressure upon the Department to grade uninspected poultry.

It must be appreciated that the consumers of poultry, rabbit, and other meat products are rarely capable of differentiating between grading and inspection. The appearance of U. S. legends and stamps on such products is usually looked upon by the public as the government's guarantee of wholesomeness, edibility and safety. Under this program, poultry and rabbits are graded for quality and/or inspected for wholesomeness. The program is voluntary and industry financed, with grading not necesary for interstate movement. What then remains, other than the economic advantages to the poultry processors? It gives them a competitive advantage in selling their products, based on a government seal, which in reality is no assurance to the consumer that the product is wholesome in terms of public health protection. It also creates a maze of grades which many in the regulatory field have difficulty in understanding. Poultry and rabbits, in addition to other food products, are supposedly graded for the benefit of the consumer and such procedure was not originally designed to satisfy regulatory agencies and the industry. As an illustration of the confusion confronting a purchaser of poultry products processed under these regulations, the following official legends are reproduced.

The effort to actually inspect such products to determine edibility in terms of freedom from disease and pathology cannot be praised too highly, as it is now a weak link in the food products inspection chain. Such inspection at federal and state levels should receive wholehearted support and encouragement from all health and agricultural agencies.

The State of Colorado has taken positive action to correct what is believed to be a deceptive practice, misleading to the consumer, and

Inspected and graded — Inspected not graded

commercializing on his inability to properly differentiate between confusing legends, all of which bear U. S. identification. The regulation was adopted by the State Board of Health and later confirmed by the State Agricultural

Examples of Official Identification for Dressed Poultry and Ready-to-Cook Poultry

Graded not inspected

Commission. It is now in force and reads as follows:

> "All dressed poultry sold within the state of Colorado, which bears a grade designation, but has not been officially inspected by an agency of either state or federal government shall bear the statement 'Not inspected' in block lettering of at least 12 point pica type. Such declaration shall be placed below and contiguous with the grade designation."

It is believed that most interested state health departments could enact such regulations by virtue of authority granted them in the labeling sections of their food and drug codes. In substance, the declaration is merely a means

of clarification of what is considered as a misleading identification.

Efforts should be made to correct the now existing Production and Marketing Administration (PMA) regulations, and prevent the recurrence of similar situations in the future by demanding that all meat, poultry and rabbits be inspected as a prerequisite for grading.

Grading represents economic classification and inspection, public health protection.—*Martin D. Baum, D.V.M., M.P.H.**

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Increase in Real Wages

The prospect that average real hourly wages will double in about 30 years, if production per man-hour continues to rise at the same average rate as in the past, is held out by the Committee for Economic Development (CED) in a statement of national policy.

Real wages are what money wages can buy. Today the average employee receives about $1.33 an hour; in 1900, the average was about 43 cents per hour in terms of 1949 prices. This increase in real income has actually been greater than is indicated by figures, since employees generally have taken part of the gain in the form of more leisure time. Average hours of work have decreased by nearly one-third since 1900, according to the Committee's report. Gain in real wages has been made possible by the increase in output per man-hour in terms of 1949 dollars. In 1900, output per man-hour averaged 50.5 cents; in 1950, approximately $1.83. This rise has been achieved by improvements in production processes, advances in health, training and skill of the labor force, and improvements of management.

Future increase in real wages must depend on the same factors plus "more interested workers."

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While corn must be considered as a standard grain for fattening cattle, carefully controlled experiments have demonstrated conclusively that steers often may be fattened more economically on barley, oats or grain sorghums instead of corn.—*Arthur D. Weber, Kansas.*

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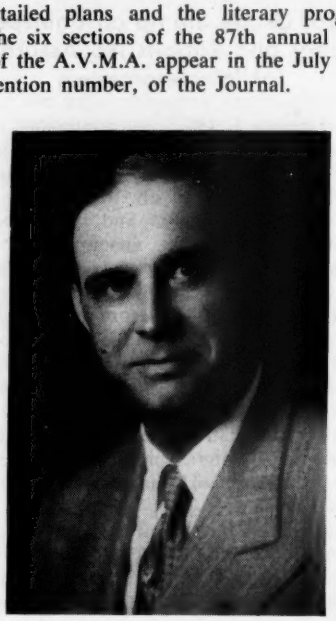
The refusal to inject virus into a herd of pigs showing evidence of internal parasites, enteritis, pneumonia, or malnutrition may lose clients now and then, but it will save a lot of headaches.—*R. L. Jewell, D.V.M.*

*Director, Veterinary Public Health Services, State of Colorado Department of Public Health, Denver.

A.V.M.A. Miami Beach Meeting August 21-24, 1950

Detailed plans and the literary programs for the six sections of the 87th annual meeting of the A.V.M.A. appear in the July 1950, convention number, of the Journal.



Dr. C. P. ZEPP, Sr., president of the A.V.M.A

Florida veterinarians have extended a cordial invitation to all to visit in Florida this summer and have prepared, in addition to a splendid technical program, arrangements for entertainment that promise to be as delightful as they are unique.

Mrs. C. E. Bild, chairman, Committee on Women's Activities, and her committeewomen have arranged receptions, sightseeing trips, teen-agers' parties, and other social functions for the families of visiting veterinarians.

The Miami Beach meeting will offer opportunity for a vacation in combination with participation in the deliberations on veterinary matters.

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Dr. W. L. Stroup at Corinth, Miss., provides the facilities for annual clinics of the Northeast Mississippi Veterinary Association. Practical demonstrations will feature this year's program, which will be followed by a free barbecue. This and the annual Waterloo, Iowa, clinic are the only two regular meetings of this kind that continue to be popular with practitioners of these sections.

Poultry Subject to Import Regulations

To guard against the entry of such devastating diseases as Asiatic or European Newcastle disease and fowl plague, the USDA is adding poultry to the list of imported animals which must go through a period of observation under quarantine before entry is permitted.

An amendment to the Department's Bureau of Animal Industry Order 379 became effective June 18. It now requires that import permits be obtained for poultry from all parts of the world except Canada and Mexico.

Poultry presented for import will be held in quarantine and inspected by veterinarians of the BAI until it has been determined that they are free of any foreign disease. Poultry 60 days of age or older will be held for at least 15 days counting from the day of arrival at the port of entry. During quarantine, such poultry shall be subject to such inspections, disinfections, blood tests, or other tests as may be required to determine their freedom from disease.

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Effectiveness of antihistamine in relief of dermatophytosis has been demonstrated by workers at the Army Medical School in Washington (*Sci.*, June 23, 1950). Prompt relief of symptoms of pain, pruritus, swelling, and inflammation, and healing are reported to follow single applications of pyribenzamine, diphenylpyraline and other chemotherapeutic agents of this group.

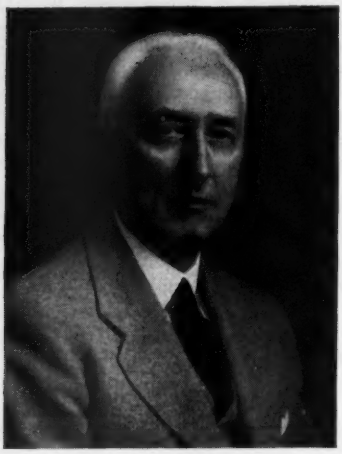
Laboratory and field tests are scheduled to study the action to determine effectiveness of antihistamine preparations in this and other ringworm and fungus infections.

A.V.M.A. 87th Annual Convention Miami Beach, Florida
August 21-24, 1950

This aerial view shows a group of the many luxurious hotels built along the fine beach. A.V.M.A. convention visitors are assured the finest hotel accommodations, including beach, cabana colonies and swimming pools, at a fraction of the winter season rates.

Doctor Dykstra Honored at Iowa State College

Dr. Ralph R. Dykstra, dean emeritus of the School of Veterinary Medicine, Kansas State College, Manhattan, was one of five Iowa State College alumni to receive the Alumni



Dr R. R. Dykstra

Merit award at the annual Alumni Day dinner at Ames, Iowa, June 10, 1950. The awards are bestowed upon outstanding alumni in recognition of pre-eminent service in advancing human welfare.

Doctor Dykstra received his degree of Doctor of Veterinary Medicine at Iowa State in 1905. In 1917, he became dean of the School of Veterinary Medicine at Kansas State College, serving in that capacity until 1948.

He specialized in the field of veterinary surgery and disease prevention. He is the author of the text Animal Sanitation and Disease Control, and has written numerous articles for professional journals. He is department editor of VETERINARY MEDICINE.

In 1917, Doctor Dykstra was president of the Kansas Veterinary Medical Association of which he has long been a member. He was president of the American Veterinary Medical Association in 1932, and for ten years served as president of the Association of American Veterinary Deans. He is also a member of the United States Livestock Asociation, Research Workers in Animal Diseases, and American Men of Science.

Doctor Dykstra is a York and Scottish Rite Mason and a past master of Blue Lodge. He has been a Rotarian since 1919. Fraternities of which he is a member are the Gamma Sigma Delta, agriculture honorary; Phi Kappa Phi, scholastic honorary; and Sigma Xi, science honorary.

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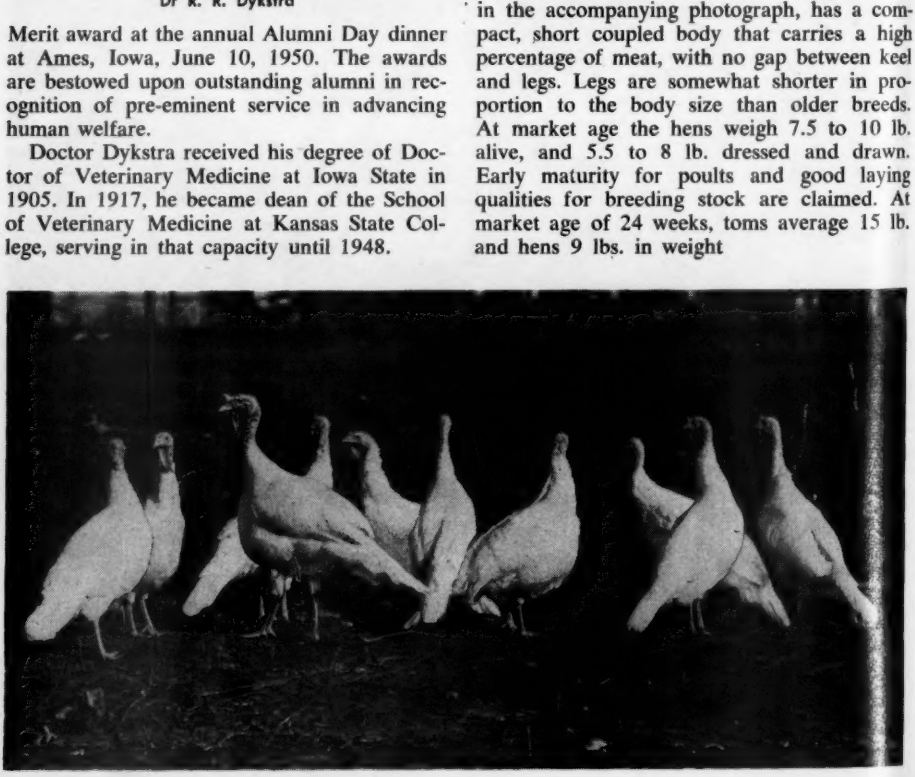
New Breed of Small White Turkeys

The Beltsville Small White turkey, shown in the accompanying photograph, has a compact, short coupled body that carries a high percentage of meat, with no gap between keel and legs. Legs are somewhat shorter in proportion to the body size than older breeds. At market age the hens weigh 7.5 to 10 lb. alive, and 5.5 to 8 lb. dressed and drawn. Early maturity for poults and good laying qualities for breeding stock are claimed. At market age of 24 weeks, toms average 15 lb. and hens 9 lbs. in weight



VETERINARY PARASITOLOGY

A. O. FOSTER, B.A., M.A., Sc.D.
Beltsville, Maryland

Swine Eperythrozoonosis

Studies of three outbreaks of acute icteroanemia of swine in Iowa and Kansas have revealed generalized infection with blood parasites belonging to the genus Eperythrozoon[1]. The organisms, similar to those already known in cattle and sheep, are regarded as two new species, namely, *Eperythrozoon suis* and *E. parvum*[2]. Infections with both organisms have been produced experimentally, and the evidence in hand strongly incriminates *E. suis* as the etiological agent of the acute, sporadic disease of swine. In one pig inoculated with both organisms. *E. suis* rapidly displaced *E. parvum*. Splenectomized pigs that relapsed with *E. parvum* did not develop symptoms; they were readily infected with *E. suis*, however, and subsequently developed the characteristically acute, febrile, icteroanemia. Two of four such test animals succumbed to the infection.

From a diagnostic standpoint, it may be noted especially that the course of the infection parallels that of experimental eperythrozoonosis of cattle and sheep, and that only a few organisms remain in the erythrocytes after the anemia has become severe. Therapeutically, neoarsphenamine is reported to have shown promise.

Eperythrozoonosis of swine may be widespread in the Corn Belt and Great Plains states, and has been recognized for many years as an anaplasmosis-like condition.

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Cysticercosis of feedlot-fattened cattle in the Salt River Valley, Ariz., was traced to the contamination of irrigation ditches and fields by a few ranch workers who were carriers of the beef tapeworm, *Taenia saginata*. The condition was controlled by the detection and treatment of the human carriers, and the provision of suitable toilet facilities†.

[1]Splitter, E. J., and Williamson, R. L., Eperythrozoonosis in Swine. *Jour. Am. Vet. Med. Assn.*, 116:360, 1950.

[2]Splitter, E. J., *Eperythrozoon suis* n. sp. and *Eperythrozoon parvum* n. sp., Two New Blood Parasites of Swine. *Sci.*, 111:513, 1950.

†Sussman, O., and Prchal, C. J., *Taenia saginata* in Man and Cattle in Arizona. *Jour. Am. Vet. Med. Assn.*, 116:365, 1950.

The New Insecticides for Controlling External Parasites of Livestock, is the title of a 25-page circular, E-762 (Revised), issued in April 1949 by the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, Washinton 25, D. C. It answers many questions repeatedly asked by veterinarians and others about DDT, BHC, chlordane, toxaphene, TDE, methoxychlor, and piperonyl butoxide. The available information is concisely summarized on the action of these insecticides against many important species of livestock pests, on formulations that have been found effective, on the comparative toxicity of these materials to the several classes of domestic animals, and on restrictions and potential hazards that contraindicate some uses of the chlorinated compounds.

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In recent trials in Australia*, sheep keds and body lice, on both shorn and unshorn sheep, were killed by dipping infested animals in concentrations of 0.001% gamma benzene hexachloride. Nearly comparable efficacy was obtained with emulsions of 0.02% DDT. These small concentrations may be better visualized as the equivalent of using only 2.15 ounces of wettable benzene hexachloride (6% gamma) or 5.35 ounces of wettable 50% DDT, in 100 gallons of water. The first of these formulations represents about a 1:100,000 dilution of the active ingredient (gamma BHC) and may be compared in efficacy to the 1:45,000 concentration of rotenone in the dilute derris dip for sheep ticks (six ounces of derris or cube, containing 5% rotenone, in 100 gallons of water).

Pupae and eggs were not destroyed in these trials but enough of the chemical remained on the animals to kill emerging adults and hatching larvae; no infestations were noted during post-treatment observations of one month. Although higher concentrations than those described would have to be employed for dipping large numbers of animals, the findings show the high potency of chlorinated insecticides and suggest that formulations may vary in different localities on account of possible differences among geographical strains of parasites in sensitivity to the chemicals.

*Graham, N. P. H., and Scott, Marion T., *Jour. Coun. Sci. Ind. Res.*, 21(4) 266-274, (November), 1948.

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

A summary of the progress made in poultry research by the United States Department of Agriculture is included in the Report of the Chief of the Bureau of Animal Industry for 1949.

In the field of poultry diseases, studies on the survival time of *Salmonella gallinarum*, the causative agent of fowl typhoid, in litter and soil indicated that this organism survives a comparatively short time when exposed to climatic conditions outside the animal body. In one group of normal birds placed in a pen one day after removal of the last sick bird, 50% died from fowl typhoid. In other trials, no birds died when placed in infected pens nine and 12 days after the last sick bird was removed.

Rats, which had access to chickens dead from fowl typhoid and then allowed free access to pens of normal chickens, transmitted the disease to the normal birds.

Other poultry diseases studied by the Bureau included Newcastle disease and pullorum disease with special reference to the XII_2 variant strain of *Salmonella pullorum*. Of interest in the latter studies was the observation that the variant strain of *S. pullorum* seems to spread more rapidly by contact than do the standard strains.

Investigations on poultry parasites were concerned chiefly with coccidiosis, treatments for worms, and for lice. Coccidial oocysts were found to survive for 86 weeks in soil in shaded and partly shaded areas, and for as long as 66 weeks in areas not shaded. Borax was found to be of limited value for prevention of cecal coccidiosis but effective concentrations caused the treated birds to lose weight. One antibiotic, bacitracin, was found to be ineffective against cecal coccidiosis.

Studies to determine the effect of continuous feeding of a mixture of nicotine-bentonite and phenothiazine in poultry mash, on growth and egg production indicated that this mixture can be fed safely to a laying flock. Chemical tests for traces of nicotine on eggs from treated birds gave consistently negative results.

Benzene hexachloride was found to be safe for controlling lice in poultry. No off odors will be transmitted to the eggs laid or to the flesh of treated birds, by the proper use of this chemical.

The ideal solution to the dirty egg problem is to prevent eggs from getting dirty in the first place. Kahlenberg, who made this statement at the Institute of American Poultry Industries Conference, stated also that it is estimated that improperly washed eggs are costing the industry 30 million dollars per year. He lists 17 specific "do's" and "don't's" to guide the processor and poultryman in salvaging the maximum amount from dirty eggs that are produced in spite of precautions to avoid them. The reader is referred to the original report in *U. S. Egg* and *Poultry Magazine*, May 1950, for details on the problem of washing eggs. He emphasizes that proper washing methods should do three things: (1) Remove contamination from the shell surface; (2) carry it away so it will not be redeposited on the shell surface; and (3), leave the shell surface in good condition to be rinsed and dried.

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This is the season to be on the lookout for hexamitiasis of turkey poults. This disease affects poults from one to ten weeks of age, and is caused by a protozoan parasite, *Hexamita meleagridis*. Characteristic symptoms are listlessness, sagging wings, a tendency to huddle in groups, and a diarrhea with watery, foamy droppings. The temperature of the sick poults starts to drop even before the first visible symptoms are noticed, and at the crisis may be two degrees below normal.

The disease is best prevented by rearing poults entirely separate from adult turkeys, pheasants, quail, peafowl and chukar partridges. All these species are susceptible and may transmit the infection to young poults. Treatment is difficult, but increasing the temperature of the brooder a few degrees will help to reduce losses. If it can be given early in the outbreak, 3% dried whey in a 1:2,000 aqueous solution of copper sulfate, as a substitute for all drinking water, for a few days is recommended. Fresh supplies of this mixture must be kept before the poults. The whey settles out rapidly so frequent stirring is necessary. Most poults will readily take the whey-copper-sulfate mixture for four or five days and it results in an increased food consumption and an improvement in the flock within a week.

ABSTRACTS OF LITERATURE

Aureomycin Stimulation of Chick Growth

Aureomycin hydrochloride and certain other antibiotics stimulate the growth of chicks when fed in the diet at levels as low as 25 mg. per kg.[36]. This growth-promoting effect is not limited to APF-deficient chicks. Results of trials indicate that the growth of normal hatchery run chicks fed several different rations, including commercial starter mash, is significantly increased by the inclusion of this antibiotic in the feed.

A number of source materials have been reported to possess growth-promoting activity greater than could be accounted for on the basis of their vitamin B_{12} content. Since these natural materials are not known to contain any antibiotic, the relation of the effect of these to the growth stimulation induced by aureomycin is difficult to assess. It may be possible that the factor present in the natural supplements and the factor presumably produced by the action of aureomycin on the intestinal flora of the chick are similar.

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Milk Protein for Treatment of Protein Deficiencies

Among the various types of proteins, milk albumin is the most valuable one with respect to biological activity because of its high content of exogenous amino acids. Given a value of 100, other protein may be expressed to show the relationship with milk albumin[37]:

Protein Source	Value
Milk Albumin	100
Flesh, Fish, Eggs	95
Potatoes, Soybeans	75
Cereals	50
Leguminous Plants	25

Milk albumin is recommended for use in nutritive preparations employed in the prevention and treatment of conditions resulting from protein deficiencies. Such preparations also contain lecithin, calcium oxide, lactose, and the inorganic salts found in milk. —*G. L.*

[36]Whitehill, A. R., *et al.*, Stimulatory Effect of Aureomycin on the Growth of Chicks. *Proc. Soc. Exp. Bio. & Med.*, 74:11 (May), 1950.

[37]Hoffman, Karl Franz, Conditions Due to Protein Deficiencies and Their Control. *Die Milchwissenschaft*, 4:429, 1949; *Eiweissforschung*, 1:97-113, 1948.

Rhesus Factor in Veterinary Medicine

The Rh (Rhesus) antigen is an agglutinin discovered by Levine and Wiener when they investigated accidents caused by blood transfusions given during pregnancy, and by fetal erythroblastosis. Thus, they could explain the condition known as icterus gravis neonatorum familialis. Clinically analogous conditions can be observed in newborn mules. A mule-foal born of a mare which has been crossbred to an ass, often develops an anemic condition a few hours after its birth. Sometimes symptoms of icterus are present, followed by hemoglobinuria and disturbed digestion. Caroli and Bessis describe this type of icterus in mule foals as being similar to the condition caused by the Rh factor. Investigations[35] proved that certain agglutinins were present in the mare's milk and blood serum and in the young mule-foal. These agglutinins act on red blood corpuscles of ass and mule. Treatment of affected animals consists of inducing premature birth, and bleeding the mule-foal, followed by transfusion of blood from a mule or horse. Feeding should be other than dam's milk.—*R.S.*

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Calcium Metabolism and Requirements of Farm Animals

A dairy cow eliminates over 34 gm. of calcium oxide daily in 44 lb. of milk and over 1 kg. of CaO in 20 liters of urine, or about 400 kg. (approximately 880 lb.) per year, without consideration of the amounts eliminated in the feces[37]. Mineral elements cannot be replaced by others, as is possible with certain organic nutrients. Calcium deficiency disturbs the animal's health and causes loss of weight. On the other hand, feeding too much calcium is unsound since a surplus in the system is eliminated as calcium phosphate, formed by the calcium combining with phosphorus; thus, the body is deprived of this important element. It is important to keep the acid-base balance of the system by adding to acid feed (grains), calcium carbonate and to basic feed (potatoes), calcium chloride. The Ca/P ratio in feed should remain 2:1, to avoid rachitis and osteomalacia.—*R.S.*

[35]de Vos, N., The Rhesus Factor and its Importance in Veterinary Medicine. *Die Veterinärmed.*, 1:152, 1948; *Vlaams Diergeneesk. Tschr.*, 17:2, 1948.

[37]Mangold, E., Calcium Oxide Metabolism and Calcium Oxide Requirements of our Farm Animals. *Die Veterinärmed.*, 1:141, 1948; *Forsch. u. Fortschr.*, 24:46, 1948.

Aureomycin: Its Topical Use in Dermatitis in Dogs

R. L. BURKHART, V.M.D.,* and JACK BLACK,*
Pearl River, New York

Laboratory and clinical investigations on the use of aureomycin have shown it to be highly effective against a wide variety of bacterial and fungal infections, as well as certain viral and rickettsial infections. Braley and Sanders[1] first reported on the topical application of aureomycin in various ocular infections, and found it particularly effective in staphylococcal, coliform, pneumococcal, and viral infections. In their work, a borated salt of aureomycin in 0.5% solution at a pH of 7.5 to 7.8 was used. However, at this pH, both aqueous and physiological saline solutions rapidly lose activity.

Aureomycin hydrochloride, in high concentration, is incorporated in an ointment base composed of petrolatum and lanolin for local application in animals. This is a stable preparation and is nonirritating. It is applied directly to the involved area.

Case Reports

Three young female dogs in a laboratory animal colony developed dermatitis which persisted for two to three months. There were no evident complicating disease processes. There were intense pruritus, generalized alopecia, marked thickening of the skin, rash, and, occasionally, scab formation. Microscopic examination of skin scrapings for mange mites was negative and a symptomatic anatomical diagnosis of dermatitis was made.

Aureomycin topical ointment was applied to the affected areas every other day for eight treatments in one dog and 16 treatments in the other two. The infected areas were not cleansed prior to treatment. In all cases, clinical improvement was evident following the fourth treatment. At this time, there was softening of the skin and decreased itching. Rapid improvement followed; there was healing of the lesions; and regrowth of hair took place. At the end of the treatment period, clinical recovery was achieved. There was no evidence of toxicity nor irritation noted in any of the dogs treated. In figures 1 and 2, are shown two of the three dogs before and at the end of the treatment periods.

*Lederle Laboratories Division, American Cyanamid Company.

Comment

The effect in these cases was due to aureomycin since no other therapeutic agent was used. Likewise, the bland ointment with aureomycin in no way caused any form of tissue irritation common to surface antiseptics. The dramatic results encouraged continuous application, but the intensity of treatment may have been unnecessary.

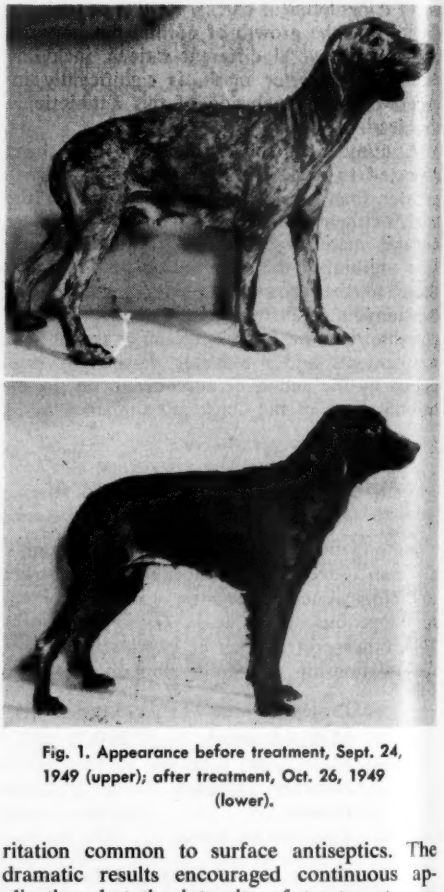

Fig. 1. Appearance before treatment, Sept. 24, 1949 (upper); after treatment, Oct. 26, 1949 (lower).

The exact causes of dermatitis in small animals are difficult to ascertain. Pruritus and irritation, from whatever cause, lead to scratching which may result in bacterial and fungal infections. While no bacteriological studies were performed in these cases, numerous studies over a period of several years have resulted, at one time or another, in the isolation of practically all of the pathogenic bacteria usually associated with normal and pathological

skin. The field of action of aureomycin is wider than that of chemotherapeutic agents in current use, highly active against both gram-positive and gram-negative bacteria, molds, several of

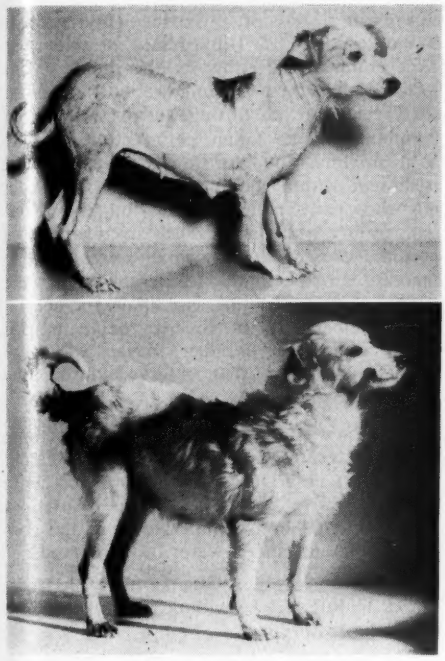

Fig. 2. Appearance before treatment, Sept. 7, 1949 (upper; after treatment, Oct. 11, 1949 (lower).

the viruses, and rickettsiae. The clinical response obtained in the cases presented suggests the wider trial of aureomycin topical ointment in troublesome skin conditions in small animals.

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1. Braley, A. E., and Sanders, M., Aureomycin in Ocular Infections: A Study of Its Spectrum. *Ann. N. Y. Acad. Sci.*, 51:280, (Nov. 30), 1948.

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The nodular worm, *Oesophagostomum radiatum*, is at least one of the causes of so-called tropical diarrhea of calves in Puerto Rico, and causes anemia, stunting, and other serious symptoms. The weight gains per day of infected calves were only about one-seventh of the gains of uninfected controls§.

§Andrews, J. S., and Maldonado, J. F., Some Clinical Aspects of Experimental Esophagostomiasis in Cattle. *Amer. Jour. Vet. Res.* 4(12):211-225, 1949.

The Effect of Varying Levels of Thyroidal Stimulation on Adrenals under Different Environmental Temperatures

M. MAQSOOD, University of Cambridge, England

In view of the effect of high temperature in depressing the thyroid secretion rate in mice[1,2] and rabbits,[5] the present work was undertaken to study the effects of variations in environmental temperature and thyroid status on the adrenals of immature male mice and rabbits.

Administration of *d*, l-thyroxine (protamone) in sufficient doses to immature male mice, kept at 24 C. for four weeks, caused a significant increase in the weight of the adrenals, whereas thiouracil treatment resulted in a decrease which was more marked at 30 C. High environmental temperature, *i.e.*, 30 C., alone caused a decrease in the adrenals weight, probably due to a decrease in the thyroid secretion rate, while administration of minute doses of *d*, l-thyroxine to the mice, checked to some extent the decrease in weight of the adrenals, but adverse effects were observed with larger doses. The levels of thyroidal stimulation which caused an increase in weight of the adrenals, also resulted in an increase in weights of the testes and seminal vesicles[3,4]. At those levels there was also an increase in body weight gain of the treated mice[3] and no lesions of any pathological significance could be seen in the pieces of livers[3].

In the young male rabbit, thyroidectomy or thiouracil administration, retarded the body growth and resulted in a decrease in the weights and functional activities of the adrenals, testes and seminal vesicles. Thyroidal stimulation within the so called physiological range, stimulated body growth and resulted in an increase in the weights of adrenals, testes and seminal vesicles. Histological examination of these organs showed an increase in their normal functional activities. Administration of higher doses of thyroxine, for longer periods, caused a decrease in the functional activities and weights of these organs, indicating that the time relationship is very important in the response of the adrenals to prolonged thyroidal stimulation, as after having caused hyperplasia of the adrenal cortex, it later on led to its exhaustion. In another experiment, simultaneous administration of thyroxine and thiour-

*Work carried out in the Department of Physiology and Pharmacology, Michigan State College, U.S.A.

acil in proper doses did not show any marked changes in the adrenal cortex. In the young growing male rabbits, castration was followed by enlargement of the adrenals and a decrease in the weight of the thyroids. On histological examination of the adrenals of the treated rabbits used in these experiments, it was observed that the changes, either hyperplastic or atrophic, were confined to the adrenal cortex.

These results, besides showing the effects of high environmental temperatures and thyroid stimulations on the adrenals, also suggest that there may probably exist either a direct or an indirect interrelationship between the thyroids, adrenals and testes.

The writer is grateful to Dr. J. Hammond, F.R.S., and Dr. A. Walton, University of Cambridge, U.K., and Professor E. P. Reineke, Michigan State College, U.S.A., for very kindly providing the facilities to work in their laboratories.

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2. Maqsood, M., and Reineke, E. P. Proc. 5th International Conference of Zootechnie, Paris, p. 73, 1949.
3. *Idem. Am. Jour. Phys.*, 160:253, 1950.
4. *Idem. Ibid.*, (in the press), 1950.
5. Maqsood, M. (unpublished data).

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A pheasant-chicken hybrid known as the Northwestern has been developed by James H. Knowles of Kelso, Wash. The originator of this hybrid began work on its development in 1933 and according to him (*Poultry Tribune*, pp. 43-44, Nov. 1949) 200,000 were produced in 1949.

The Northwestern begins with a cross between a Ringneck and a Mongolian pheasant. The offspring of this cross mated with a Cornish Game by artificial insemination produces a half-pheasant, half-chicken hybrid. All the males of this cross die, and most of the females are infertile. The fertile females can be determined by Knowles at hatching. Out of 1,700 eggs set, only 21 fertile females were produced last year. When these fertile females are crossed with a chicken male, all the female offspring are sterile, but a small percentage of the males are fertile. These males become the sires for New Hampshire females to produce the final Northwestern market bird. Both the males and females of this final cross are sterile. These natural capons will develop into 7.5-pound roasters at 18 weeks of age, according to the originator.

Effects of Hypo- or Hyperthyroidism on the Internal Body Temperatures of the Rabbit and Sheep

M. MAQSOOD, University of Cambridge, England.

Varying levels of thyroxine (thyroprotein containing 2.7% *d*, l-thyroxine) or thiouracil were administered either in the ration or injected daily to growing male rabbits and sheep for varying periods throughout the year. Body temperature was taken per rectum, weekly or fortnightly. The data showed that thyroxine treatment within the physiological range did not show any marked effect on the rectal temperature while larger doses given for longer periods caused a somewhat corresponding increase in the body temperatures of the treated animals. The increase above the normal body temperature of the thyroxine treated rabbit during the summer season was relatively higher than that observed during the winter season.

Thiouracil administration, or thyroidectomy generally resulted in a decrease of 1 to 2 F. in body temperature when compared with their respective controls. Seasonal variations in the internal body temperatures of the control rabbit and sheep were also observed.

I wish to express my thanks to Dr. J. Hammond, F. R.S., for providing facilities to work in his laboratory.

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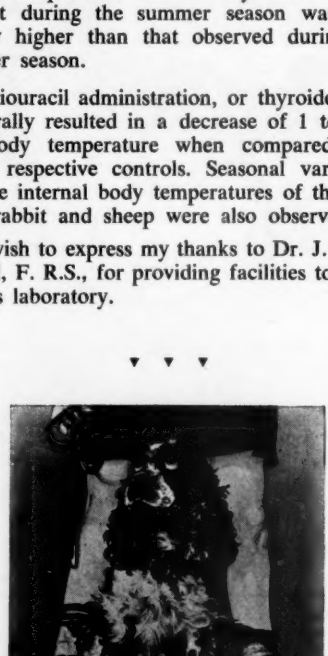

Official poster design of 1950 NATIONAL DOG WEEK to be observed Sept. 24-30.

BOOK REVIEWS

Books reviewed in this department and any other books, if available, may be obtained by remitting the published price to the Book Department, Veterinary Medicine, Suite 803 Livestock Exchange Building, Kansas City 15, Missouri.

LEHRBUCH DER SPEZIELLEN CHIRURGIE FUR TIERARZTE UND STUDIERENEDE (Textbook of Special Surgery for Veterinarians and Students) by *Prof. Dr. Erich Silbersiepe,* Director of Surgery at the University of Berlin Tierklinik (animal clinic) and *Prof. Dr. Ewald Berge,* Director of the Surgical Clinic in the Veterinary College at Giessen. Eleventh edition. 524 pages; 457 illustrations. Ferdinand Enke, Hasenbergsteige 3, Stuttgart, W. Germany publisher, 1950.—Price 42 marks (about $11.50) postage prepaid.

This splendid work has developed over a long period and has an interesting and illustrative history. The first edition appeared in 1898. It and three succeeding revisions were written by the illustrious Prof. Dr. Eugen Fröhner of Friedberger and Fröhner "Special Pathology and Therapeutics" fame. Doctor Fröhner was joined by Eberlein in the fifth and sixth editions and by Silbersiepe in the seventh edition. Due to his advanced age, Doctor Fröhner undertook no further revisions, but the work was carried on by Silbersiepe, who, later joined by Berge, has contributed four more revisions over the years and brought this monumental work down to date, making it the outstanding textbook in its field for more than one-half century.

While the text has expanded in the many revisions, the field treated has contracted. Diseases of the female genitalia, disease of the mammary glands and obstetrical maneuvers, once a part of the text, are omitted from the present edition as being subjects for texts of their own. The descriptions of operations now regarded as minor or simple have been deleted or much condensed to allow space for the description of new operations and those difficult to perform. For example, not elsewhere in veterinary literature can be found descriptions of delicate operations on the eye that are comparable with those in this work for clarity and completeness. Forty-eight pages are devoted to this subject.

Throughout the work a rather extensive knowledge of anatomy, on the part of the reader, is assumed. However, the many illustrations, unequaled for variety, applicability, and number in a work on this subject, will aid those whose anatomy is somewhat "rusty" in grasping the subject.

It is difficult to pick out subjects for special mention on the ground that they rise above the general level of the work, but to this reviewer the paragraphs on the causes and treatment of paralysis of the muscles of mastication, differential diagnosis of intra-abdominal ailments, the therapy of those conditions that grew out of the experiences of World War II, and diseases of the feet seem most outstanding, together with surgical diseases of the eye already mentioned.

Considerable number of American veterinarians and veterinary students who are familiar with the German language will find this text ideal for both reference and classroom study.—*C. A. Zell, D.V.M., Ph. D.*

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PRINCIPLES OF HEMATOLOGY, by *Russell L. Haden,* M.A., M.D., Chief of the Medical Division of the Cleveland Clinic, Ohio. Third edition. 366 pages, with 171 illustrations. Lea & Febiger, Philadelphia, Pa., publisher.—Price $5.00.

This volume was written to simplify studies of disorders of the blood. It is recommended for veterinarians interested in making use of laboratory diagnostic methods.

"In the exact sense of the word," states the author, "there are no diseases of the blood. The fundamental problem in every disease disorder of the blood is to obtain all possible information concerning the level of essential elements and the rate of formation and loss." To understand thoroughly the fundamentals of production, circulation and loss of blood elements will simplify the apperception of clinical hematology.

Blood dyscrasia is dependent primarily on changes in the cellular elements. Cell types can only be increased or decreased in number or show qualitative changes. Further, only three types of cells, erythrocytes, leukocytes, and thrombocytes (platelets) are involved in hematology. Each of these three types of blood cells is discussed separately in succeeding chapters and the mechanism by which changes

in each cell come about is finally considered. Disturbances in the formation, circulation and destruction of cells, or a combination of these factors, or some abnormality in the physiology of the clotting elements are basic in all blood dyscrasias.

Technical methods of blood examinations are described in detail, and disorders grouped. Over 100 case reports illustrate clinical features of blood disorders in man according to the author's grouping. Treatment and course in these is given, together with general comments, some of which can be applied generally to pathological conditions in animals. The work is an authoritative guide.

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ANIMAL DISEASES IN SOUTH AFRICA, by *H. W. Henning,* M.R.C. V.S., D.Sc., Professor of Veterinary Science, University of Pretoria. Second edition, revised. 879 pages, 123 illustrations. Central News Agency, Ltd., Johannesburg, South Africa, publishers, 1949. —Price $9.20.

The title of this textbook may be somewhat misleading since the contents are limited to discussions, in classical textbook style, of the bacterial, protozoal, and virus diseases only of domestic animals, primarily of meat-producing livestock.

Of especial value are the chapters on rinderpest and foot-and-mouth disease. In these, the newest information is incorporated to bring textbook material on these subjects up to date. Each chapter is appended with an extensive reference list that includes publications from various parts of the world.

Although the majority of the diseases described have universal distribution, or nearly so, others are confined largely to the continent of Africa and are of particular interest to South African practitioners.

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ANTIBIOTICS, by *Robertson Pratt,* Ph.D., and *Jean Dufrenoy.* D.Sc. 255 pages, with 66 illustrations. J. B. Lippincott Company, Philadelphia, publishers, 1949. —Price $5.00.

Antibiotic therapy is only eight years old, yet it has developed so tremendously that by 1948 penicillin and streptomycin alone accounted for more than half of the sale of all synthetic drugs. Since then, many more antibiotics have been discovered and there is no doubt that their importance for human as well as veterinary medicine will continue to grow. Therefore, this book, written by two staff members of the University of California, College of Pharmacy, should prove very helpful to those who wish to learn more about the facts and principles relating to the wide field of antibiotics.

In addition to penicillin and streptomycin, the authors discuss chloromycetin, aureomycin, tyrothricin and a number of newer antibiotics not yet used in veterinary medicine.—R.S.

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TEXTBOOK OF MEAT INSPECTION, by *Horace Thornton,* B. V. Sc., M.R.C. V.S., D.V.H., F.R.S.I. 659 pages, 257 illustrations, Alexander Eger, Inc., Chicago, American publishers, 1949.—Price $12.50.

This book directs attention toward the study of meat inspection and control. The entire field of inspection of foods of animal origin is covered in a comprehensive manner that should serve not only as a student text but as a reference work for those engaged in inspection service. Modern Continental practices, together with those used in the United States, Argentina, and England, reflect the magnitude of the work.

Of especial merit is the discussion included under the chapter heading, Comparative Anatomy of Tissues and Organs, dealing with the position, drainage area and the destination of efferent lymph vessels of nodes of cattle, swine and sheep. This portion of the text material is well illustrated by drawings of carcasses as viewed by the inspector. Postmortem findings in tuberculosis are exhaustively treated. Inspection of rabbits, poultry and fish are discussed in separate chapters.

The author of the text is a British lecturer and authority on meat inspection and a veterinary inspection officer in that country.

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Bulletins — Circulars — Booklets

Capon Production.—A 43-page pamphlet on all phases of the production of capons by operative procedure. The purpose of caponizing, the characteristics of capons, the breeds best adapted to caponizing, age and size at which to caponize, the caponizing operation and the equipment needed are examples of subjects discussed in the bulletin. Also included is a short section on so-called caponizing with hormones.—Kan. State Agr. Exp. Sta. Bul. 335, Revised.

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Adequate fresh, clean water is essential for maximum egg production.

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Man has been and is still the prime factor in the extermination of many species of wild animals and birds.

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It is estimated that 2,000 stomach worms of sheep, *Haemonchus contortus,* remove about 30 cc. of blood daily from their host.

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Continuous use of sulfonamides in poultry rations tends to reduce fertility and hatchability.—*B. S. Pomeroy, D.V.M.*

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In 1900, whooping cough claimed the lives of 497 children (in Illinois); in 1948, thanks to immunizations, only 28 children died from this disease.—*Illinois Health Messenger.*

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The use of stored citrated blood was introduced into the United States at the Cook County Hospital in Chicago in 1937, where the "blood bank" idea originated.

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The normal blood cell count in normal turkeys is reported by Wai and Stafseth to average 2,600,000 erythrocytes and 12,000 leukocytes per cubic millimeter.—*Poul. Sci.,* May 1950.

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The findings in studies at the University of Iowa that 3.2% of test lots of eggs taken from 56 cases contained Salmonella, emphasizes that the potential hazard of infection from uncooked eggs is greater than heretofore has been recognized.—*Pub. Hlth. Rept.,* June 16, 1950.

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In 1850, milk production per cow averaged about 2,365 pounds per year. After 1890, introduction of the Babcock test, the expansion of the factory production of butter, cheese, and evaporated milk, particularly in the Middle West, and later the expanded market for fluid milk, encouraged better dairy breeding and feeding practices. By 1909, milk production per cow had stepped up to 3,800 pounds, and in 1949, with the end not even in sight, it had risen to 5,329 pounds.—*Agr. Sit.,* May 1950.

Improvement of meat quality, finish, and flavor follow stilbestrol implantation in turkeys.

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There are now about 19,000,000 more people in the United States than ten years ago.

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As many as 500 mature ascarids have been found in one pig.

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Increased amounts of polysaccharides in the blood were found in 96% of a series of 105 cancer patients.—*S.N.L.*

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One important cause of the development of white feathers in the wings of turkey poults is a deficiency of lysine in the ration.

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Personnel concerned in the eradication of foot-and-mouth disease in Mexico includes 1,150 employees of the United States and over 6,000 Mexicans.

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New facts are established not on the basis of results obtained from a single experiment, but by a review and proper interpretation of many experiments.

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Feeding heads from poultry that have been treated by stilbestrol implantation prior to slaughter may be responsible for some reproductive failures observed by some fur breeders.

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To get a high protein content in grass and legume hays, harvesting should be timed so that the operation is completed before the grass reaches full-bloom stage.

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Western Europe's Marshall Plan countries have boosted their agricultural output to within 5% of prewar level, according to a restricted index published by the USDA.

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A simplified test for albuminuria is announced by the Ames Company, Inc., Elkhart, Ind. The reagent used is a stable tablet containing sulfasalicylic acid. It is the latest of a group of four reagent tablets designed to provide accurate, inexpensive, and simple tests of urine.

Systematic Treatment And Control Of Streptococcic Mastitis*

G. R. SPENCER, D.V.M., M.S., Ph.D., JOSEPH SIMON, M.S., D.V.M., and MARY L. SCHENK, B. S., Madison, Wisconsin

THERAPY of bovine mastitis is used now mostly for single quarters or for severe cases in a herd. These individual cases often can be benefited by proper treatment. Individual treatment of single cases helps the dairy farmer but does not prevent infection in other animals of the herd.

Systematic treatment or herd treatment has been proposed for control of mastitis. By this method, veterinarians have attempted to eliminate the streptococcic infection from carriers and subclinical cases, as well as the clinically affected. Early treatment of carriers has been found more successful in eradicating infection and in preventing the development of clinical mastitis, which results in tissue damage and lowered milk production. In Connecticut, Plastridge[1] reported eradication of *Streptococcus agalactiae* from 17 of 30 herds by repeated testing, and treating infected cows with penicillin. Stableforth and coworkers,[2] were able to eradicate *Str. agalactiae* from seven out of ten herds in a few months by intensive penicillin treatment, and disinfection of barn equipment and the external surface of the teats.

During the past nine years, experimental control programs for mastitis have been established in dairy herds in the vicinity of Madison. Results have been good in some and poor in others. Therapeutic measures were applied as soon as their use was indicated. Systematic penicillin therapy has been helpful in prevention and control of streptococcic mastitis in most cases. The results in some of these will be presented.

Herds, in which the incidence of chronic mastitis was high, were selected for experimental control programs. Histories were obtained from herdsmen and a careful examination was made of each cow. Quarter samples of milk were tested in the laboratory by the Hotis test, microscopic examination of incubated samples and by streak plating of incubated samples on blood agar. Frequency of testing varied on different farms and from time to time, but usually was carried out at least twice a year. Hygienic steps recommended included use of a strip cup, a milking order of heifers first and normal-appearing cows next, and disinfection of the hands and teat cups between each cow, as well as at the end of the milking process.

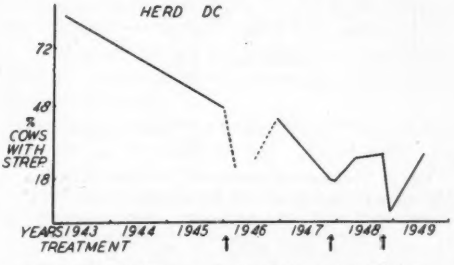

Fig. 1. The incidence of streptococcic infection in herd DC where the barn hygiene was good continuously from 1943 to 1949.

Not all these hygienic recommendations were accomplished. Systematic treatment was used on all herds during the period 1946 to 1949. Various doses of drugs and vehicles were tested. Control quarters were treated with vehicle alone for the purposes of the therapy experiments. Controls usually were retreated with penicillin at the end of the experiment.

Herd Data

Herd DC (fig. 1) was a group of 50-60 purebred Holstein cows. At first examination in 1943, a severe mastitis problem was evident. Forty of the 47 lactating animals were infected with streptococci and 14 were giving abnormal milk. The herdsman initiated a program of good sanitation and gradually eliminated the severely affected cows, with a gradual improvement over a period of years. The records after

*Presented at the 34th annual meeting of the Wisconsin Veterinary Medical Association, Milwaukee, January 12-13, 1950.

From Project No. 475 on the Diagnosis and Control of Chronic Bovine Mastitis, Wisconsin Agricultural Experiment Station, and supported in part by a grant from Grasseli Chemicals Department, E. I. Du Pont de Nemours Co., Wilmington, Del. Published with the approval of the Director of the Wisconsin Agricultural Experiment Station.

the first penicillin treatment, made by the late J. W. Porter in 1945, were not available. Some spread of infection occurred and by early 1947, 42% of the cows were infected. Two treatments at yearly intervals reduced the incidence of streptococcic infection but did not eliminate the organisms entirely. During the interim between systematic treatments, clinical cases of mastitis were treated promptly. All streptococci isolated during 1948 and 1949 were typed and no *Str. agalactiae* were found. *Str. uberis* was the most prevalent species. Clinical cases of mastitis were infrequent during 1948 and 1949. It appears likely that *Str. agalactiae* has been eliminated from this herd. The program of good barn hygiene and elimination of diseased cows was probably the

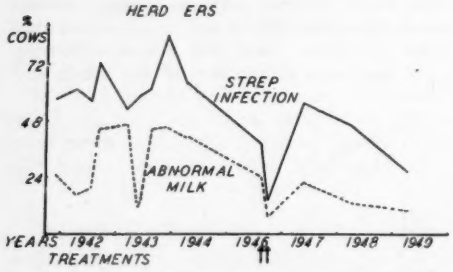

Fig. 2. Streptococcic infection in herd ERS. The herdsman improved the barn hygiene in 1944. Abnormal milk was correlated directly with the incidence of streptococcic infection.

most important factor in successful control, though systematic treatment made possible such recovery in some cows which otherwise would have been sold for slaughter.

Herd ERS (fig. 2) had about 20 purebred Brown Swiss cows, hand milked until 1946. On first examination in 1941, abnormal milk was being produced by six cows, and 19 out of 23 were infected with streptococci. Little effort, other than proper milking order, was made to prevent transfer of infection until 1944 when a fair program of disinfection of hands was begun. Some of the older infected cows were eliminated during 1944 and 1945, but no examinations or tests were made during 1945. Penicillin treatment during 1946 left only three infected cows. Very little abnormal milk was observed in this herd for a post-treatment period of several months, after which time infection spread rapidly. In 1947, an improvement was affected in methods and the herd began to benefit. The incidence of abnormal milk was closely related to that of streptococcic infection except after treatment. In the period following this course of treatment, a smaller proportion of infected quarters produced abnormal milk. This herd illustrates the long term value of good barn hygiene and the fleeting value of penicillin treatment alone.

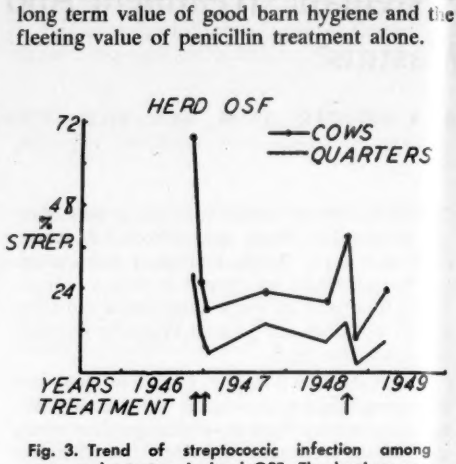

Fig. 3. Trend of streptococcic infection among cows and quarters in herd OSF. The hygiene was good and effective control was established.

Another herd, OSF, fig. 3) had a 67% incidence of streptococcic infection in spite of fair hygienic practices. The incidence of abnormal milk was not markedly high. Two treatments at short intervals eliminated most

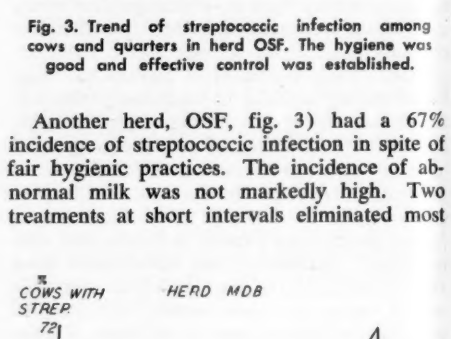

Fig. 4. Streptococcic infection in herd MDB. Two periods of rapid spread occurred and treatment was the principal factor in control.

streptococcic infections and very little reinfection occurred for two years. After a change in personnel in 1948, infection began to spread. Prompt systematic treatment reduced the incidence and the infection rate was slow thereafter. The results in this herd illustrate the great value of combined good hygiene and systematic treatment. *Str. agalactiae* was not found at the last test in this herd.

The herd MDB (fig. 4) was in good condition during 1942 and 1943. There was rapid

spread of infection in early 1944, following a change in milking personnel. Some time during 1945 this herd was treated once or twice but no records of this period are available. In 1947 and 1948, another spread of infection occurred. Three systematic treatments during a few months reduced this outbreak to a low level, but it spread slowly during 1949. This herd is one in which systematic treatment partially controlled streptococcic mastitis in spite of variable hygienic practices.

Herd SB (fig. 5) had a moderate spread of streptococcic infection during 1942. In 1943, this was reduced by elimination of severely af-

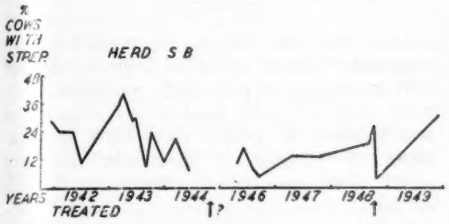

Fig. 5. The streptococcal infection in herd SB. The incidence remained low and no serious clinical mastitis occurred.

fected animals. A low incidence of streptococcic infection was maintained during the next few years. In 1948, a slight spread occurred so systematic treatment was applied. Symptoms were relieved in cows. During 1949, streptococcic infection was found in a few animals. This herd revealed very little clinical streptococcic mastitis at any time. It is doubtful if systematic therapy was indicated in this herd because the benefits of the program did not, in the owner's opinion, justify the expense of therapy or testing.

In addition to those described, 42 herds have been systematically treated to eliminate carriers of streptococcic infection. Of these, the majority have been tested for one or more years after treatment to determine the long-term effect of systematic therapy. Several beneficial effects have been observed. There was usually an immediate reduction in clinical mastitis and abnormal milk. This benefit was ordinarily retained for a period of from three months to two years. Only three herds of the group studied apparently have been freed of *Str. agalactiae* udder infections but, as a rule, the incidence in all has been greatly reduced. Infection usually spread after treatment and at a rate which appeared to be directly related to the matter of careful barn hygiene or to other management factors. A lowered incidence of streptococcic infection was observed for at least a year following systematic treatment providing accepted hygienic practices were followed.

Discussion

Systematic penicillin therapy in conjunction with good sanitary practices should be utilized to a much greater extent to control streptococcic mastitis. Lack of laboratory testing facilities may prevent the establishment of the Connecticut program in certain areas of Wisconsin. Because, of this, a systematic therapeutic program which does not require laboratory facilities is proposed for herds with chronic mastitis. The essentials of the program are as follows:

1. Selection of herds with a history of much chronic mastitis and ones in which the herdsman is cooperative. The cost of the program, the need to discard two milkings after treatment, and the basic importance of hygiene should be explained to the owner before treatment is begun. No promise should be made to prevent all mastitis in such herds.

2. Use of the best diagnostic measures available to detect the carrier animals and actual cases of mastitis.

a. Strip cup by the dairyman.
b. Brom thymol blue test.
c. Palpation of the udder.

3. Infuse quarters listed with 100,000 units of penicillin in an oil-water emulsion base.

a. All quarters of cows with a history of mastitis.
b. All quarters of cows in the third or later lactation.
c. All quarters of cows reacting to tests for mastitis.

4. Advice to the owner.

a. Discard for animal feed the first two milkings after treatment.
b. Practice hygiene to prevent further spread of mastitis.

(1) Milk heifers first, clean cows next, and mastitis cows last.
(2) Disinfect hands and teats during milking process with a mild chlorine solution. Use a 0.5% lye solution for teat cups between milkings.
(3) Milk regularly, rapidly and thoroughly; strip by machine.
(4) Avoid teat injuries by providing plenty of bedding and adequate room.
(5) Have all cases of acute mastitis treated promptly.
(6) Sell cows which do not respond to treatment.

This program of treatment substitutes extensive use of penicillin for laboratory diagnostic measures. Treatment of all four quarters of all cows except normal-appearing animals in the first or second lactation will ensure that almost all infected quarters will be treated. Stableforth has recommended that all quarters of each cow in the herd be treated. This probably would be desirable in very severely affected herds. However, for routine therapy, it is still an experimental procedure.

The herdsman's duties in the program of systematic treatment are most important. The need for discarding the first milkings which contain large amounts of penicillin must be recognized fully. Cheesemakers have found that penicillin hinders starter action and sometimes spoils whole batches of cheese. For fluid milk, the mineral oil vehicle often comes to the top and gives an unappetizing appearance. If 60 quarters are treated in a herd, more than a liter of mineral oil has been given.

The most important elements of sanitation and hygiene are mentioned in the outline above. A milking order of heifers first and mastitis cows last helps to curtail the spread of infection down the milking line. Nevertheless, if a heifer develops mastitis she should be milked with the affected group. Disinfection of the hands and the teat cups is vitally important. For this purpose, solutions of hypochlorite should be mixed according to the directions to contain approximately 200 parts per million of available chlorine. Between milking periods, teat cups can be hung in a rack and filled with lye solution. Thorough, regular milking helps reduce teat injuries. Removal of the teat cups as soon as the milk stops flowing and provision for a plentiful supply of bedding also will prevent teat injuries. Prompt treatment of cases of acute mastitis will often circumvent serious losses from that type of the disease.

Many herds have one or more cows which do not respond to treatment. The veterinarian may be able to pick out some of them before he treats and save the cost of the drug. Older cows with clinical mastitis in two or more quarters, as well as quarters that have been severely swollen for a long time, are not good subjects for treatment. If the herdsman insists on treatment of such animals, he should be warned that the chance of permanent benefit is slight. Exceptionally valuable cows that do not respond to a single treatment can be retreated at three-day intervals for two or more times.

This program of systematic treatment will be of little or no benefit to herds with mastitis due to organisms other than streptococci. Staphylococci, coliform organisms and *Corynebacterium pyogenes* are occasionally responsible for mastitis in some animals. Such infections may become relatively more important in the future as therapy reduces streptococcic infections. For herds in which penicillin therapy has not proved of value or those in which the clinical picture indicates other types of infection, laboratory tests may help establish a diagnosis. Trial treatment with antibacterial agents other than penicillin is indicated also in these herds.

Summary

The long-term results of mastitis-control programs based on approved hygiene, together with treatment, are described. Systematic antibiotic treatment gave good results when it was accomplished by proper dairy farm management. A program of systematic treatment which does not require laboratory tests is outlined.

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Etiology of Sterility in Mares

From results of ten years of experimental work, Dr. G. Bareggi, assistant professor of pathology, Veterinary College, University of Milan, Italy, states that it is practical to sextuple the sexual efficiency of a stallion by artificial insemination, and at the same time to double the average percentage of pregnancies in mares.

In the Lombard regions, an irrigated lowland country in Italy, Doctor Bareggi considers that the systematic administration of calcium and vitamin D gave confirmation of the deficiency state thought to be responsible for sterility.

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If bakery operations were carried out in accordance with basic slaughterhouse standards, the public would be horrified, and sales of such goods would go down to a new low.—*Martin D. Baum, D.V.M., M.P.H.*

Tattoo Application To The Ear Of Cattle

FRANK E. WILHITE, D.V.M., Atlanta, Georgia

PRIOR to 1941, personal experience with tattoos had been limited to reading them in an occasional purebred animal. Many were dim and difficult to distinguish. The impression was given that tattooing was a difficult, impractical procedure. The writer since has learned that with the exercise of a little time and care even a novice can make permanent, easily read markings.

There are five essential elements in correct tattooing:

1. Proper restraint of the animal.
2. Thorough cleaning of the tattoo site.
3. Careful location of the marking in the ear.
4. Deep impression of the needles into the tissue.
5. Thorough working of the ink into the needle impressions.

Restraint

Most veterinarians will appreciate the necessity for proper restraint; however, owners not infrequently fail to do so. For my work, a bull lead is preferred or, if the owner objects, a stout rope halter. A sudden lunge when pressure is being applied to the tattoo instrument may result in a ripped ear, which causes a nasty wound as well as a botched tattoo, or a wrenched, broken or catapulted instrument, the latter being a very dangerous missile for those in the immediate vicinity.

Cleaning the Tattoo Site

Clean the tattoo site with absorbent cotton dampened with rubbing alcohol. The importance of this procedure is to remove all dirt and ear wax. The ear wax in particular, if not removed, repels the tattoo ink and prevents a good "take."

Location of Markings

There are two points of consideration in regard to location of the tattoo. First, locate the mark well in toward the base of the ear and out of the hair line which extends inward for a variable distance from the margins of the ear. Tattoos in the hair line are difficult, if not impossible, to read. Second, select a location between, not on or across, the cartilaginous ridges which parallel the long axis of the ear. A tattoo placed on or across these ridges results in irregular marking, the strongest at or near the height of the ridge and illegible between the ridges. There are four of the ridges and three grooves or concave surfaces. Of these grooves, the center is preferred. Second choice is the upper groove; the only objection being that, depending on or across the type of tattoo instrument used, it is often necessary to bend over the lower margin of the ear in order to properly locate the tattoo instrument in this groove. Least desirable is the lower groove because it is usually the shortest and smallest of the three and is frequently deeply pigmented. This latter is especially true in the Jersey breed.

Procedure

Occasionally good tattoos tend to disappear in a year or two. In such cases, tattoo needles had penetrated only into the superficial epithelial layers which in the normal course of time grew out and were shed. The use of both hands on the tattoo instrument effects deep penetration and in the author's work tattoo needles are made to pierce entirely through the ear. The extra pressure exerted has the advantage of producing a temporary anemia in the area, which allows the operator to apply the ink before much hemorrhage has taken place. Another point in this connection, which might be mentioned here, is that if the tattoo instrument is placed in the ear with slight pressure, quickly but gradually increased, the animal reacts less violently.

After trial of several methods of working the tattoo ink into the needle impressions, use of an ordinary toothbrush has been found satisfactory for briskly scrubbing the ink into the needle impressions. This works equally well with liquid or paste type of ink. For use with liquid ink, a baby food jar, which is small enough to set on a fence post or other convenient ledge and shallow enough to allow about half of the toothbrush handle to stick out, provides a suitable ink container. Into

(*Continued on page* 358)

Urinary Calculi In An Aged Bull*

DESMOND H. HILL, D.V.M., Nigeria, South Africa

THE etiology and predisposing causes of urinary calculi in domestic animals have given rise to numerous speculations and theories on the part of different authors. Basically, at least, it would appear that these calculi result from the deposition in a solid form of the normal or abnormal constituents of the urine. Gaiger and Davies[3] mention several of the main factors concerned, such as the deposit of salts when present in the urine in excess, ammoniacal fermentations during cystitis, calcium and phosphorous imbalance, the presence of foreign bodies serving as nuclei for calculus formation, and the predisposing causes such as reduction in the intake of fluids, retention of urine, and certain foods such as bran, mangolds, water in limestone districts, highly nitrogenous foods, and diets deficient in vitamin A, etc.

Frank[4] points out that the calculi in sheep and cattle consist mainly of calcium, magnesium, and aluminum salts of phosphoric acid, and also mentions that the condition frequently arises during the winter months. According to Pflug[5] phosphatic stones increase in size more rapidly than do the others. Rathke[6] has observed that in cattle, the size of a stone may develop from that of a pin's head to that of a bean in three weeks.

Case History

This case is perhaps worthy of special note since it brings to a close the career of a great bull, Montvic Rag Apple Sovereign (XXX), the sire of more progeny registered in the herd books of the Holstein-Friesian Association of Canada than any other bull that ever lived,[2] having 674 daughters and 561 sons in the registered Canadian herd book. Born at Mount Victoria Farm, Hudson Heights, Quebec, on April 17, 1942, he was sired by Emperor of Mount Victoria (who is still in service) and out of Montvic Rag Apple Colantha Abbekerk (Ex.). He ended his grand contribution as sire to the Holstein breed at the barn of the Oxford Holstein Breeders' Association, Woodstock, Ontario, where he made his last service on August 17, 1949.

This bull first showed colic-like symptoms in June 1949, these being overcome following the administration of lentin. It was also suspected that he was a little sore on both hind feet and these were trimmed. On July 1, however, it was noticed that the bull seemed unable to urinate. He was put in the stanchion and gently manipulated in the region of the base and anterior part of the scrotum, whereupon urination occurred almost immediately. Examination per rectum of the pelvic portion of the urethra and the urinary bladder failed to reveal any obstruction or other pathological condition of the urinary tract. The bull made his last service on August 17, and the main train of symptoms followed soon after this date. By August 19 there was marked loss of appetite and uneasiness, accompanied by frequent stretching. No urine was noticed as having passed on this day. On the following day, symptoms were exaggerated, with well marked pulsation of the penis. Pain was evinced. Examination per rectum revealed a taut, enlarged bladder. A few drops of bloody fluid were noticed falling from the prepuce. The tautness and enlargement of the bladder increased still further, while penial pulsation became more pronounced, accompanied by evidence of abdominal pain (stretching).

By this time there was complete loss of appetite. The attending veterinarian decided to perform immediate high urethrotomy, under local anesthesia, using 17 cc. of a 2% solution of procaine hydrochloride epidurally, and 20 cc. locally. A windshield wiper hose catheter was inserted. The urethra was grossly distended and bloody fluid escaped in gushes. Postoperatively, 3,000,000 units of procaine penicillin were given intramuscularly. The bull ate and drank following surgery. Body temperature remained normal under the influence of repeated penicillin administration. For a day or so, appetite continued fair with only slight signs of uneasiness. By August 23, however, the condition appeared worse and it was decided to send the bull to the clinic at the Ontario Veterinary College.

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Subsequently, the bull was put on the table and attempts made to expose the penis. A sound was passed through the incision in the urethra in an attempt to locate the obstruction, but this sound could not be passed beyond the sigmoid flexure. The penis could not be exposed and owing to the fact that the bull seemed unable to force any urine through the urethra, the catheter was reinserted into the bladder and left in position. Appetite remained capricious for a few days but improved considerably following the administration of a tonic consisting of a solution of arsenous acid, strychnine and cobalt sulfate. Three million units of procaine penicillin were given intramuscularly, at three-day intervals. A "T" shaped metal catheter (fig. 1) was inserted into the urethra and proved satisfactory (fig. 2). The sheath was irrigated periodically with a mild solution of dettol. It might be of interest to note that until this

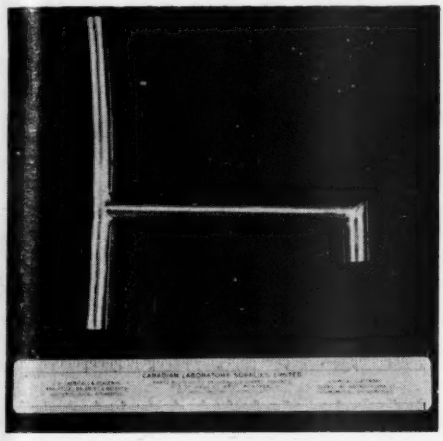

Fig. 1. "T" shaped metal catheter fashioned for use in the case reported.

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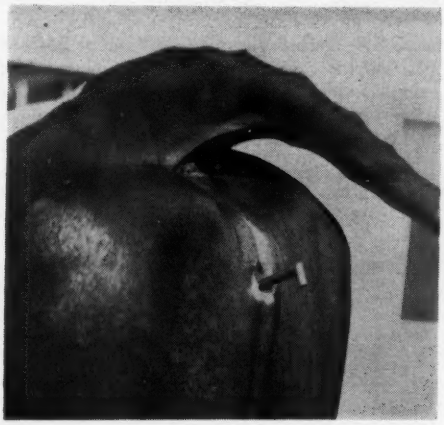

Fig. 2. Photograph showing cannula (fig. 1) in position.

appetite commenced to fall off rapidly, although urination did not seem impaired. The gait became increasingly stiffer and a reluctance to move was manifested. By September 18, anorexia was marked and the temperature had risen to 104 F. Six million units of procaine penicillin were administered intramuscularly, and one liter of 5% dextrose solution was given intravenously. By September 24, pus could be observed draining from the end of the sheath. An exploratory puncture revealed an abscess in the region of the penial swelling

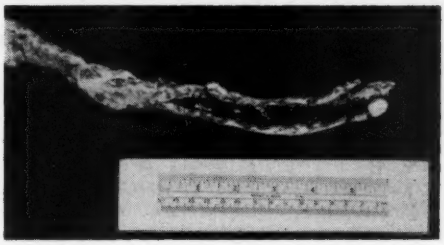

Fig. 3. Removed portion of the necrotic urethra and the obstructing urethral calculus.

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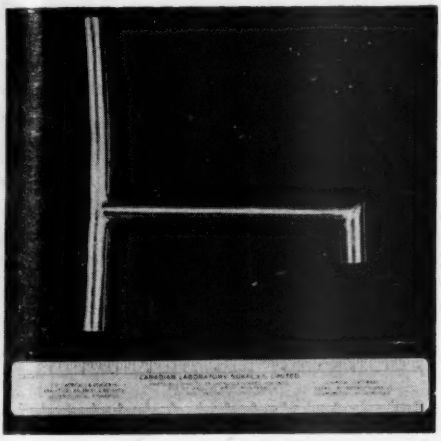

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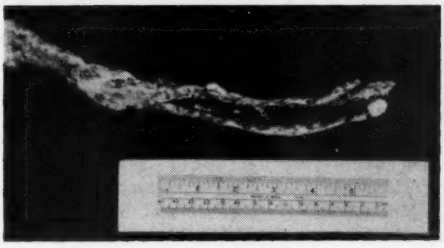

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For the few months that followed, a gradual decline in health occurred, with increasing

stiffness in gait and loss of flesh. The cannula gradually worked itself out of the urethra and a small, permanent fistula served as the urinary orifice. Urine analysis at this time showed an alkaline reaction, a specific gravity of 1.016, sugar negative, albumen positive (triple plus), and a centrifuged microscopic sample exhibited rare red cells and numerous triple phosphate crystals. A tentative diagnosis of cystitis was made.

Euthanasia was performed on December 24, 1949. Postmortem findings were necrotic urethritis above the sigmoid flexure, abscesses

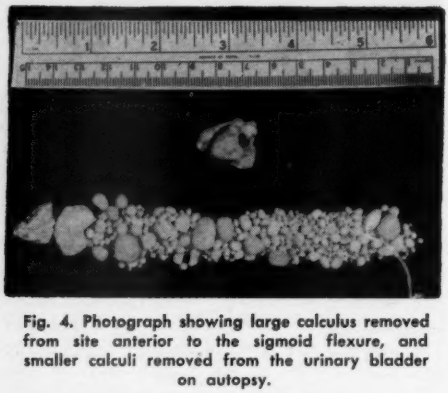

Fig. 4. Photograph showing large calculus removed from site anterior to the sigmoid flexure, and smaller calculi removed from the urinary bladder on autopsy.

lateral to the crural arch; and several hundred calculi (fig. 4) in the urinary bladder. A diagnosis of pyelonephritis and cystitis was made.

Discussion

Urinary calculi occurred in an aged bull which had not previously exhibited any evidence of the condition until about six weeks prior to the date when urethrotomy was imperative; neither were there any known predisposing causes.

The main obstruction appeared to be from a large calculus situated just anterior to the sigmoid flexure, which later resulted in abscess formation and necrosis of the urethra. A "T" shaped metal cannula was inserted in the urethra, just below the level of the tuber ischii. This appliance proved useful. Attempts to collect semen via the cannula were also successful, although the semen so obtained was useless for breeding purposes due to the presence of pus cells and debris. Owing to the gradual decline in the health of the bull, euthanasia was decided upon, some six months from the date when first symptoms were observed.

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Acknowledgments

Personal observations were greatly augmented by having access to the clinical records and reports of the Department of Medicine, the Department of Pathology, and the Extension Department, of the Ontario Veterinary College.

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Significance of Parasitism in Sheep

In consideration of some aspects of parasitic gastroenteritis of sheep in Australia, Gordon* has calculated the worm burdens during epidemiological investigations in the northern tablelands region. On the basis of these counts and in consideration of the estimated loss of blood due to these parasites, a daily loss of 1,248 gallons is calculated for this sheep-producing region.

When it is realized that during outbreaks worm burdens may be increased at least tenfold, the quantity of blood loss and resulting loss in meat and wool is quite impressive. In this, it is extremely difficult to estimate the costs of diseases caused by worm parasites because of their insidious onset and subclinical effects. Furthermore, unthriftiness resulting from malnutrition is often a sequela of gastrointestinal parasitism. This in addition to mortality suffered in outbreaks, which is considerable.

Appropriate anthelmintic treatment might be expected to reduce markedly, if not prevent, death losses due to parasitism. Effect of treatment on body weight, gains, and wool production has been reported in much experimental work. The tools now available, imperfect as they may be, are of great economic importance both in preventing losses and for use in low grade infections not obvious to shepherds.

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Artificial stimulation of estrum is all that is required to effect resolution in many cases of metritis in cows.

*Gordon, H. M. L., *Aust. Vet. Jour.*, 26:46 (Mar.), 1950.

Feline Practice*

WILLIAM F. IRWIN, D.V.M., Tulsa, Oklahoma

IN consideration of the importance of cats in our practice, examination of records disclosed the fact that practice with these animals was responsible for about 8% of the gross income. It may constitute even larger proportions in many small animal hospitals. In Tulsa, there are very few active cat breeders, compared to the number ten years ago. The percentage of purebred is small; the popular breed being the cross-breds, common alley variety. Eight per cent of a practice may not seem like much of a factor, but it is safe to venture that the net gain in feline practice will run considerably higher than in canine practice. Cats require very small amounts of food or drugs and little grooming and exercise as compared to hospitalized dogs.

Veterinarians frequently emphasize their dislike of cats; consider these animals difficult and dangerous to treat, and avoid treating and hospitalizing them. This attitude is usually due to a lack of understanding of habits and traits peculiar to the feline family. Cats resist any methods of forced restraint, and as soon as the veterinarian and his assistants appreciate this one characteristic, they will experience less trouble with such patients. Cats respond to treatment better than dogs, and ordinarily fewer complications develop to cloud diagnosis.

Some Feline Peculiarities

Another peculiarity of the cat, includes its attachment to places rather than to people; a cat will leave a new home and return to its former domicile when a family moves. In the application of this trait, it is important always to return a cat, after daily treatment, to the cage previously occupied.

Strange dogs are natural enemies of cats and progress is aided if these pets are confined in a cage where they cannot see or hear dogs.

Practically all tricolored cats are females. The author has never seen an exception although it has been reported.

Toenails of a cat are part of its defensive equipment and should not be trimmed. Some cats will refuse food and hide for several days after having their toenails trimmed. New nails grow rapidly.

A cat will seldom eat old, spoiled or tainted foods. Food for hospitalized patients should be fresh and clean, and, it is preferable to feed them at night after the lights are out and wards are quiet.

The cat is a natural animal of prey, though it seldom devours its catch. Many times it will bring rats, mice or young rabbits home and place them close to its regular feeding area. It is said that this habit indicates it is paying for its food and keep. A good Fox Terrier will kill 20 rats or mice while a cat is catching and playing with one.

Cats prey on birds and have brought many a curse on themselves for doing it. A small bell attached to a collar or harness will prevent bird-catching by the city cat.

The unneutered male cat will often spray urine in the house leaving a very offensive odor. Castration will, of course, correct this undesirable habit. Solutions of roccal, or similar quaternary ammonium product, will eliminate the odor of urine in hospital cages or other premises frequented by cats.

Idiosyncrasy to some drugs used in canine practice is demonstrated. Some of these are: phenol or coal tar products, benzo-benzoate compounds, morphine, and pine oil solutions. Cats do not like drugs that have strong odors, and because of the habit of licking their coats in grooming themselves, one should avoid using drugs that are stomach poisons, on wounds, skin lesions, or for the treatment of external parasites.

A female in estrum may go through some peculiar antics of rolling and tumbling on the floor that cause the inexperienced owner or young veterinarian to fear the pet is suffering from some strange illness.

Cats differ from dogs in disposition in that they either like all people or none. They do not hold a grudge for abuse or injury, but forgive and forget in a few minutes.

Feeding

Cats are selective in choosing food. Diets should be built around meat or meat products. Raw or cooked lean meat, fish, poultry, milk, kidney, and liver make up the greater portion of most useful diets. Cereals may be added to

*Presented at the 38th annual meeting of the State Veterinary Medical Association of Texas, Galveston, Jan. 23-24, 1950.

the main diet in the form of dry food prepared for dogs or breakfast cereals. Many canned foods provide a satisfactory diet if supplemented occasionally with fresh meat, liver or fish. Feline pets have the ability to adjust themselves to various diets and dietary deficiencies and resulting diseases are rather uncommon. Owners should be warned about feeding liver and kidney exclusively as many do, since a taste is acquired for these and other foods are refused, which may unfortunately result in poor condition.

Infected Fight Wounds

Infected wounds are common ailments of the city cat. This is especially true during the spring and fall breeding seasons when the toms are congregating in the neighborhood of queens in estrum. The very nature of bite wounds predisposes development of deep abscess formation. The long, slender fangs are forced into soft tissues of the legs, tail, head and neck to their full length, leaving a deep puncture wound with no provision for drainage. Cats harbor many infectious organisms in the mouth that are inoculated into the wounds inflicted by them, and bites always result in septic wounds in man, as well as in other cats.

Clinically, fight wounds are presented in three different stages of development. In the first stage, swelling and pain, wounds are generally 24 hours old or less. The parts are swollen and very sensitive. Wounds are sometimes difficult to locate. A single dose of penicillin in oil and wax will usually arrest infection with a return to normal of the tissues in two or three days. It is not, as a rule, necessary to open these wounds.

The second stage is a later development of infection, *i.e.*, abscess formation with necrosis and sloughing of tissues. Drainage should be established by incision and debridement, sulfonamide powders or crystals applied to the wound, and a bandage applied if possible. Daily redressing and bandaging should be repeated for the first two or three days. The animal should be hospitalized and given penicillin until the wound is free from infection. Cod liver oil ointment or granulation-stimulating product can then be applied by the owner until the wound is healed.

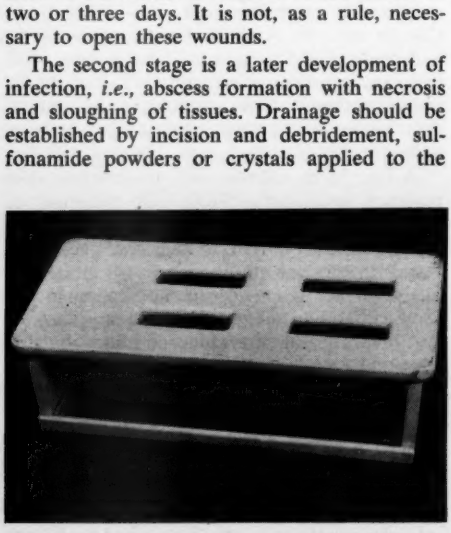
The third type is the result of neglected treatment and the animal is presented with sloughing wounds having fistulous tracts into deep structures. Surgery is required to establish drainage and to remove all diseased granulation tissue. Under general anesthesia, all discolored skin and underlying necrotic tissue to the bottom of the wound should be removed. The wound is then bandaged, if possible, after applying sulfonamide powders, and penicillin administered. As soon as the wound appears healthy, cod liver oil ointment is substituted for powders and the wound left open. Healing is usually rapid. The fighting tomcat should be castrated if kept as a house pet.

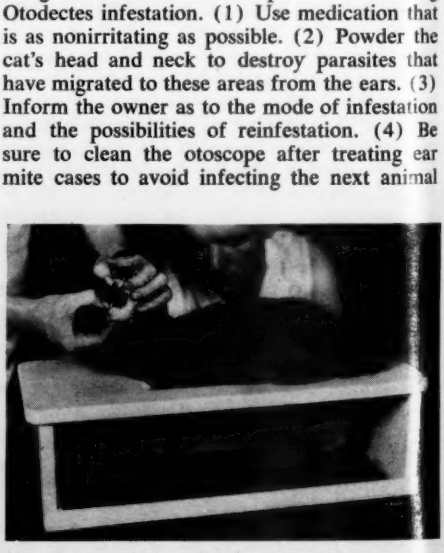
Dentistry

As in the dog, many subclinical symptoms are caused by dental sepsis in the cat. The writer likes to do scaling and extractions under pentothal anesthesia. Ten per cent chromic acid solution applied to ulcerated and infected gums and lips promotes healing.

External Parasites

Ear mites are included in this category. Four things come to mind as important in treating Otodectes infestation. (1) Use medication that is as nonirritating as possible. (2) Powder the cat's head and neck to destroy parasites that have migrated to these areas from the ears. (3) Inform the owner as to the mode of infestation and the possibilities of reinfestation. (4) Be sure to clean the otoscope after treating ear mite cases to avoid infecting the next animal





Restraint appliance for cats, such as illustrated above, is practical, useful hospital equipment

examined. Ear mites will live for several days in the exudates and debris that collect on the otoscope.

Twenty-five per cent canex (Merck) in mineral oil instilled into the ear canal and a good external parasite powder, such as those that contain benzene hexachloride, applied to the head and neck will destroy mites. No attempt is made to remove the heavy crusts and exudate from the ear canal until the second day, at which time crusts will have softened and can be removed easily. Pellitol ointment (Pitman-Moore) is injected into the canal and the owner instructed to return the animal in four or five days for a second application of the ointment.

Flea powders containing benzene hexachloride seem to handle the flea problem in cats very well. BHC is non-toxic if used with reasonable care. Ticks are not a problem with cats in our area. A few cases of spinous ear ticks have been seen. These were removed by instruments, and BHC powder dispensed to be used in and around the ears.

Sarcoptic mange is seen frequently in the cat. If doubtful about the diagnosis, a microscopic examination of skin scrapings should be made. Mites of mange seem to be easier to demonstrate in skin scrapings from cats than from dogs.

Many treatments are recommended for mange. In our practice we use a lime and sulfur dip. Although disagreeable, it results in fastest recoveries and is non-toxic. The dilution employed is one part lime and sulfur dip to 19 parts warm water. Dip or sponge the animal thoroughly three times a week until symptoms are relieved.

Ringworm

From the standpoint of effecting satisfactory results, the treatment of ringworm infestation is the most aggravating condition encountered. It is well to keep in mind that fungus infections known as ringworm are communicable from animals to man.

There are probably many types of ringworm, but clinically two types are recognized. The large ringworm with its characteristic grey encrustation, *Microsporon lanosum,* and the small multiple-lesion ringworm that appears as small, bran-like flakes over most of the body, Trichophyton group.

The Microsporon, or large type of ringworm, looks about the same as it does in the dog, and is readily transmitted back and forth between the two species, as well as to man. Topical application of fungicides is effective in this type, and can be applied by the owner with satisfactory results. Cerbinol (Pitman-Moore), a mixture of fungicidal drugs, is quite effective against this type of fungus infection. In those cases where there are a great number of lesions and the infection seems to be spreading rapidly, the use of lime and sulfur dip, as recommended for mange treatment, is effective.

In the small, multiple-lesion type of ringworm, topical application is not satisfactory because the entire surface of the skin is usually affected. Lime and sulfur dip seems to arrest the condition, but has not given permanent cures in our experience. We have not been able to control this particular fungus infection, and make it a point to have an understanding with the owner to this effect before treatment is attempted. The owner of the cat with ringworm should always be warned of the possibility of members of the family contracting the infection from the pet.

Internal Parasites

Intestinal parasites of the feline family are similar in kinds, symptoms, and treatment to those of the dog. In our area, intestinal parasites of the cat are not a problem; tapeworms are most commonly encountered. For ascarids and hookworm, the vermifuge marketed as vermiplex (Pitman-Moore) seems to be quite effective and less toxic than tetrachlorethelene. For tapeworm we like nemural (Winthrop-Stearns). One tablet for an adult.

Hair Balls

During the shedding season many cat owners observe their pets vomiting or passing hair boluses. Frequently a cat will ingest enough hair to cause intestinal stasis or obstruction. The symptoms are loss of appetite, vomiting hair balls, and scanty, hair-containing stools. The hair impaction can often be palpated through the abdomen. Treatment consists of evacuating the intestinal tract, providing a follow-up laxative for the owner to administer, with regular grooming to remove as much of the shedding coat as possible. Mineral oil or plain vaseline in liberal doses should be administered the day of entry to soften up the intestinal contents. A nemural tablet the following day will regularly effect complete evacuation of the hair impaction.

Dysuria and Urinary Calculi

Dysuria in males is common, especially in the old neutered male. Two different conditions are recognized, one where obstruction is caused by calculi and the other in which there are no calculi, but an apparent cystitis and

inflammatory condition, causing a change in the physical properties of the urine. There will often be blood, mucous shreds and debris sufficient to cause difficult and painful passage. Endocrine disturbance has been suggested as the etiological agent.

The symptoms of urinary calculi, and dysuria, as we prefer to call it, are about the same, *i.e.*, painful straining to pass urine, distended bladder, and a protruding penis. The distended bladder is easily palpated through the abdomen. A differential diagnosis can be made by finding evidence of the sand-like calculi around the penis or in the urethral orifice.

The two conditions are treated similarly. An attempt is made to relax and dilate the urethra with octin (Bilhuber-Knoll), 0.5 cc., or atropine sulfate, 1/100 gr., subcutaneously, then by gentle but firm pressure on the bladder, it is often possible to force the obstruction out of the urethra. If the cat is difficult to handle, this procedure should be done under general anesthesia. In a case of calculi which will not yield to pressure and the relaxing drugs, they usually can be removed or forced back into the bladder by patient manipulation with a 20 gauge needle that has been ground to a blunt point and used as a catheter. Lubricating jelly injected through the needle will often assist in dislodging the impacted calculi mass. Cats with urinary calculi should be hospitalized and given daily doses of octin, and gentle bladder pressure until urination is normal. As a follow-up treatment, 25,000 units of vitamin A daily for two weeks, to be repeated in 30 days, is recommended. A low ash diet is also prescribed. In dysuria where there are no stones, encouraging results are obtained with the following treatment: Streptomycin, ¼ gm., mixed with 5 cc. of amphojel (Wyeth), is injected directly into the bladder by catheter, and repeated on the second and fourth days. Octin is given orally twice daily in 2 gr. doses, and testosterone, 10 mg., injected intramuscularly and repeated in three days.

Infectious Diseases

Rabies: Cats apparently are not very susceptible to infection with rabies virus, at least in their normal habitat as city pets. In the 15 years that I have been practicing I have seen 240 cases of rabies in dogs and only one rabid cat.

There are three infectious diseases of the cat that show symptoms of high temperature, vomition, and dehydration.

This group of diseases is often referred to as cat distemper, but Leasure,[1] Dalling,[2] Riser,[3]

and others, have investigated the infections of cats rather thoroughly, and pretty definitely classified them as to their etiology. There seems to be great confusion in the nomenclature applied to these infections of felines. When referring to the infectious diseases of cats, various names are used, such as, cat fever, show fever, cat plague, enteritis, infectious gastroenteritis, leukopenia and infectious panleukopenia.

In our practice we recognize three distinct diseases based on examination of the hemogram.

(1) *Infectious Panleukopenia*: This term is applied to the highly contagious disease of young cats caused by filtrable virus and characterized by a marked and rapidly developing panleukopenia, with the neutrophils disappearing from the blood at the rate of 2,000 to 4,000 per cmm. per day; the lymphocytes being the last leukocytes to disappear.

The disease, in my opinion, is the most highly contagious disease that practitioners encounter. In a virulent outbreak, mortality may reach 90% in affected young cats. In one outbreak of panleukopenia in our city, the greater part of the young cats succumbed to the disease.

The incubation period of infectious panleukopenia is from two to nine days depending on the virulence of the virus, and the age and resistance of the individual. At the height of an epizootic, majority of young cats will become sick in about five days after exposure. The course is very rapid. The temperature rises rapidly to 104 F. to 107 F. Its return to normal is equally rapid in cases that recover. Lassitude is about the only symptom shown in the first temperature rise. Forty-eight hours later, the second temperature rise is accompanied by symptoms of vomiting, extreme

dehydration, weakness, and the characteristic attitude of lying on the abdomen and supporting the head on a water or feed pan. Diarrhea may develop, but is considered to be due to secondary infection. Nasal and ocular discharge may be present in some cases. This is also thought to be due to secondary bacterial invasion. Death usually occurs about the fifth day.

Specific homologus antiserum for infectious panleukopenia is available and is effective if given early and in 20 to 30 cc. doses. Serum is quite expensive and many veterinarians prefer to use whole blood from a donor that has recovered from the disease. Blood can be collected quite rapidly from the jugular vein and injected intravenously or intraperitoneally. The dose recommended is 30 cc. repeated in 12 to 24 hours. Dehydration is extreme in this disease and should be relieved with large doses of saline and 5% dextrose solution administered subcutaneously. It is advised to give as much of this solution as the patient will absorb readily. Sulfonamide drugs and antibiotics are all of questionable value. However, on the suggestion of Dr. R. L. Anderes of Kansas City[4] we have been using streptomycin, ¼ gm., twice daily, with encouraging results.

The antiserum gives a good passive immunity for two to three weeks in susceptible cats. Two doses of formalized tissue vaccine, given at seven to ten-day intervals, seem to produce a fairly high degree of immunity that will last through an outbreak of the disease.

(2) *Mixed Bacterial Infection*: The second disease, and one that is difficult to differentiate clinically from infectious panleukopenia, is a mixed bacterial infection which we prefer to call cat distemper. Riser[3] describes this disease and gives the Streptococcus as the chief causative organism. The observation has been, that nasal and ocular discharges develop earlier than in infectious panleukopenia, the course of the disease is longer, and mortality rate lower. The hemogram is much different than in infectious panleukopenia (see chart) in that there is an increase in the total white blood count and an increase in neutrophils with a decrease in lymphocytes, and a marked left shift.

In treating this condition, the sulfonamides and penicillin are definitely indicated and usually give very satisfactory results. Blood transfusions and saline and dextrose solutions should be given as supportive treatment.

(3) *Escherichia coli Infection*: The third disease, and one encountered only occasionally in catteries in endemic outbreaks, is *E. coli* infection. It would be practically impossible to differentiate from infectious panleukopenia and is probably misdiagnosed clinically as such many times. The symptoms are very similar and the course runs about the same as in infectious panleukopenia. Diarrhea is usually present. *E. coli* infection causes a leukopenia, the white cell count dropping to as low as 2,000 per cmm., but I have never observed a complete leukopenia as is frequently seen in the first mentioned disease. The cells present are mostly immature neutrophils with an absence of lymphocytes, or an extreme left shift in the hemogram. Treatment should be supportive and streptomycin has given encouraging results in this condition.

It can be seen that these three diseases of cats show about the same clinical symptoms. To make a diagnosis is a considerable risk without a total and differential blood count. Fortunately for the clinician, each disease has a different effect on the hematopoietic system so that a differential diagnosis can be made by examination of the hemogram. In infectious panleukopenia the virus has an inhibitory effect on the bone marrow activity, rendering it

ACTUAL BLOOD COUNTS TAKEN FROM RECORDS OF THE CITY VETERINARY HOSPITAL, TULSA, OKLA.

Cells per cmm.	Mean Normal for adult cats*	Mean Normal for kittens*	Panleukopenia (fatal)	Panleukopenia Recovered with trt. (female, 9 mo.) 10/9/47 Temp. 105 F.	Panleukopenia Recovered with trt. (female, 9 mo.) 10/15/47 Temp. 101 F.	Bacterial mixed infection (Recovered)	*E. coli* infection (male 10 mo.)	*E. coli* infection (male, 6 mo.)
Erythrocytes	7,820,000	5,210,000	——	——	——	——	——	——
Leukocytes	15,954	11,725	1,600	3,250	13,000	27,350	2,200	3,900
Neutrophils	54.26	52.4	——	——	——	——	——	——
Eosinophils	5.4	6.6	——	——	——	——	0	78
Basophils							0	78
Lymphocytes	38.68	34.0	1,280	2,470	2,470	2,735	440	858
Monocytes	1.5	1.9	——	——	——	——	——	——
Segments	0	0	320	780	9,360	23,247	1,540	2,126
Stabs				0	1,040	1,367	220	546
Juvenils				0	130	——	0	234

*Reported by Riser, W. H., The Normal Blood Counts of the Domestic Cat. *N. Am. Vet.*, 27.93 (Feb.), 1946.

non-functional in such manner that in the latter stages of the disease the leukocytes have almost entirely disappeared from the circulating blood. The neutrophils are the first to go, so that when a blood count is made during the course of the infection the lymphocytes will constitute the majority of the cells found. The blood count in infectious panleukopenia has a prognostic value as well as diagnostic aid. Our observation has been that if treatment can be started before the total leukocyte count drops below 3,000 cells per cmm., the prognosis is fair. If below 3,000, the prognosis is grave. If no cells, or only a few hundred are found, the prognosis is fatal termination within a few hours.

In mixed bacterial infection, the total white cell count is elevated to 20,000 to 30,000 per cmm. There is an increase in the neutrophils and a decrease in lymphocytes. This is almost the opposite blood picture observed in infectious panleukopenia. The greater the left shift, the more serious the infection.

In *E. coli* infection there is a leukopenia but seldom a panleukopenia; usually the white cell count will drop to 5,000, occasionally to 2,000 per cmm. of blood. The cells present are mostly neutrophils and one instantly recognizes that the condition is not infectious panleukopenia.

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Tattoo Application to the Ear of Cattle

(*Continued from page* 349)

this, only a small amount of ink is poured at a time to prevent excess drying and loss of ink if the jar tips or falls.

General Comments

In Georgia, more owners of other than purebred herds are becoming interested in tattooing because of the danger of screwworm infestation which accompanies the use of ear tags. While there seems to be very little danger of screwworm infestation in connection with tattooing, one or two owners have reported cases which they attributed to this procedure. Smear 62 seems to be similar to tattoo ink, and several owners have advised that they use this preparation for tattoo ink.

Manufacturers of tattoo instruments and ink advocate the use of ink before making the tattoo impression. One advantage, advanced by some for this method, is that some ink is carried into the needle impressions with the needle and that immediate rubbing of the ink after making the impression prevents hemorrhage which tends to wash the ink from the needle impressions. From a practical standpoint, this procedure does not carry ink deep into the impression and has the added disadvantage of being messy. It has been the writer's observation that a slight amount of hemorrhage will follow either method, but that it will not affect the tattoo.

Recently, in some few herds involving a small percentage of animals tattooed, the operation has either induced warts in the ear, or spread wart virus. In order to prevent this condition, if possible, it is good practice to dip the instrument in rubbing alcohol between animals. However, it is still too early to know whether this will be effective in preventing the condition. The antiseptic properties of the ink were formerly believed to take care of any infection which might be carried on the instrument. Observations in the field have disproved this belief and all instruments, including the brush, should be thoroughly disinfected after use on a herd.

There has been much discussion pro and con of tattooing the dark-skinned breeds, such as the Angus and Holstein, and the use of colored inks. Tattooing with regular black ink, if done properly, will show up distinctly in all but a very few of these animals. A trick learned some years ago for reading otherwise indistinct tattoos, is to use a flashlight back of the ear. The translucent light will often bring out the markings and eliminate confusion with small veins.

Epithelial tissue growing over the tattoo after a year or two causes the tattoo to assume a bluish cast. Another confusing point is the large size characters found in the ears of a few animals. These are usually the result of applying the tattoo to the very young animal. This point is sometimes of value in determining whether an animal was vaccinated as a calf or adult.

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Dr. Arthur F. Schalk, Professor of Preventive Medicine, Ohio State University, Columbus, has retired. Doctor Schalk's research work in both North Dakota and Ohio, particularly the classic studies pertaining to the physiology of the rumen and development of the rumen fistula, has been a fruitful and memorable contribution to veterinary medicine.

Occurrence Of And Treatment For The Destruction Of The African Blue Louse On Sheep In Northern Arizona

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THE African blue louse, *Linognathus africanus* (Kellogg and Paine 1911), has a recorded incidence in only a few areas of the United States. So far as we had been able to determine, this species has been recorded heretofore from Sugar City, Colo., Miami, Fla.,[1] Los Angeles, Calif.,[2] and Texas[3]. These limited reports do not necessarily indicate, however, the true distribution of *L. africanus* in this country. Since this species of louse is very similar in general appearance to *Linognathus stenopsis*, the common goat louse, it is possible that some of the louse infections on goats previously reported as *L. stenopsis* actually may have been infestations of *L. africanus*.

On August 11, 1949, a report was received of an infestation of the blue louse in a flock of rams, mostly Hampshires and Suffolks, on a ranch 35 miles northwest of Williams, Ariz. Included with the report were specimens of the lice, which were tentatively identified by one of us (Kemper) as *L. africanus*. This identification was later confirmed by Mr. Allen McIntosh of the Zoological Division, Bureau of Animal Industry, and by Dr. William L. Jellison, parasitologist at the Rocky Mountain Laboratory, United States Public Health Service, Hamilton, Mont.

The finding of the African blue louse in northern Arizona was particularly interesting because of the limited reports of the occurrence of this species in the United States. The owner of the flock believed that the infestation of his rams resulted from an introduction of infested Hampshire rams purchased in Idaho, or perhaps somewhere in Arizona.

Treatment with Lindane

Through the cooperation of the Sheep Sanitary Commission of Arizona, arrangements were effected for the dipping of the infested rams on August 26, under joint supervision of the authors and an inspector of the above-named commission. The flock consisted of 100 rams, about two-thirds of which were coarse-wooled Hampshire and Suffolk, whereas the rest of the flock consisted of the fine-wooled Rambouillet.

Linognathus africanus (K. and P.). Note angular hind head characteristic of this species. The genitalia (lower) are likewise distinctive. The female measures 2 to 2.5 mm. long, and the male about 1.5 to 1.75 mm. long. The male is more difficult to distinguish because the head is subject to distortion and the genitalia often crowded and more or less obscure.

Approximately 50% of the flock, all Hampshire and Suffolk rams, harbored infestations ranging from a few to a considerable number of these lice. No lice were found on any of the Rambouillet rams. The severity of the infestation was apparent on some rams on which patches on the sides of the body were denuded

*From the Zoological Division, Bureau of Animal Industry, Agricultural Research Administration, U. S. Department of Agriculture.

of wool as a result of the animals biting themselves, and rubbing against posts, fences, and other objects to relieve the intense irritation. Prior to dipping, additional specimens of lice were seen and collected from the most extensively infested animals. The lice were found mainly on the lateral aspect of the ribs.

The dip was prepared from a commercial wettable-powder formulation containing 25% of lindane (99+% of the gamma isomer of BHC). The powder was suspended in unheated water, and sufficient quantity was used to give a 0.045% concentration gamma BHC. Each ram was held in the vat approximately one minute, and the head ducked twice, thereby making sure that animals were thoroughly wet.

Examination of heavily infested rams 1½ hours after dipping showed all lice to be dead, or at least non-motile, and therefore presumably dead. The rams, upon examination four hours after dipping, showed no ill effects from dipping in the lindane suspension.

Sheep came out of the vat with no discoloration or matting of the fleece, and laboratory tests performed by the Southwestern Range and Sheep Breeding Laboratory, Fort Wingate, N. Mex., showed no change in the tensile strength or dyeing properties of the wool fibers. It was also observed that the lindane formulation used was practically free of the typical, musty odor of technical BHC, although in powder form it was slightly irritating to the operator when the dust came in contact with the mucous membranes of the nostrils.

Post-treatment inspections of the flock, in addition to those named, were made on September 8 and October 8, by the cooperating inspector of the Sheep Sanitary Commission of Arizona. No lice were found. A final inspection of the herd was made on November 16, 1949, 82 days after dipping, by the senior author and others. Fifteen marked rams, heavily infested prior to dipping, were examined thoroughly. Neither live nor dead lice were found on any of these sheep. All breaks in the fleece and other evidence of skin irritation present at the time of dipping had disappeared. Although formerly denuded areas could still be located, there was a new wool growth about ⅝ inch long covering these areas. All animals were in good health and grazing normally.

In view of the absence of lice 82 days following the single dipping of the flock, the infestation of *L. africanus* was considered to have been eradicated.

Summary

Linognathus africanus (Kellogg and Paine 1911), the African blue louse of sheep, was found infesting a flock of rams in northern Arizona. This is a new location for this species, which has previously been reported only from Sugar City, Colo., Miami, Fla.,[1] Los Angeles, Calif.,[2] and Texas[3] in the United States.

This infestation was eradicated by a single dipping. The dip used contained lindane in a 0.045% concentration of gamma isomer BHC prepared from a commercial formulation.

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Magnesium Tetany

Forage and grains ordinarily contain sufficient magnesium so that disorders due to a deficiency of this mineral are unlikely to occur in calves under practical farm management. When calves are fed for longer than a few weeks on milk alone without forage or grain supplements, nervous symptoms and anoxemia develop. Duncan, *et al.*, (*Jour. Bio. Chem.*, 108:35, 1935) describes symptoms of deficiency of magnesium in calves. "The animal, apparently temporarily blinded, will run into obstacles, or becoming confused will turn in circles until its balance is completely destroyed. As the convulsions become more violent, the calf may fall on its side with the legs rigid and alternately extended and contracted; there is frothing at the mouth and profuse salivation. These attacks may last continuously for several minutes or, intermittently, for a longer time. Young calves seem to be able to withstand several such convulsions but older calves usually succumb to the first attack."

Research workers at the Michigan station report calcification of the blood vessels, endocardium, and in trabeculae and capsule of the spleen as the principal lesions of magnesium deficiency. These workers suggest the possible relationship between magnesium-deficient diets and arteriosclerosis in man.

The Effect Of Therapeutic And Small Daily Doses Of Phenothiazine On The Color Of Goat Milk

F. D. ENZIE, D.V.M.* and H. KURTPINAR, D.V.M., Ph.D.**

IN view of the success attained with phenothiazine-salt mixtures in the control of gastrointestinal roundworms of sheep, raisers of dairy goats have repeatedly indicated their desire to employ this method for parasite control. Unfortunately, however, lactating animals eliminate catabolic derivatives of the chemical in the milk. The excretion products are not harmful to the consumer, but, if present in sufficient amounts, they cause the milk to become pink on exposure to air. Since the milk may develop a pinkish discoloration for a number of days following the administration of therapeutic doses of the drug, it generally has been suggested that the milk be discarded or used for other than human consumption for about one week after treatment. Also, largely on this account, the regimen of free-choice phenothiazine therapy quite generally has been regarded as contraindicated for lactating animals.

According to reports that have come to the writers' attention, some producers of goat milk have used phenothiazine-salt mixtures in concentrations generally recommended for sheep and have observed no adverse effect on the appearance of the milk. On the other hand, other producers have found that the milk becomes discolored when this method of parasite control is employed. Because of the importance to the dairy goat industry of a suitable regimen of free-choice phenothiazine therapy, a preliminary investigation was undertaken in order to ascertain the maximum daily dose of the drug that could be given without producing discolored milk. In addition, data were obtained on the persistence of discoloration following therapeutic treatments since the literature apparently contains no specific information in this regard.

Procedure

The observations were made from June 6 to July 25, 1949, on a herd of nine goats maintained by the Animal Disease Station, Agricultural Research Center, Beltsville, Md.† The does were of mixed breeding and each was nursing either one or two kids when the experiment began. The animals were confined on a small permanent pasture throughout the test period. The pasturage was supplemented with grain and a mixture of clover and timothy hay. Unfortunately, dairy goats in full production were not available for this investigation.

For a period of five weeks, various amounts of phenothiazine were given daily in hard gelatin capsules to six goats. Two animals, (7 and 48), were retained as controls. Three goats, (8, 36, and 38) were given 1 gm. of the drug daily for 35 days. Another group of three animals (12, 32, and 39) was given 0.5 gm. daily for 15 days, and for two succeeding ten-day periods 2 and 3 gm. per day, respectively. At the end of the first 15 days, goat 43 was substituted for goat 32 because of difficulty in obtaining milk samples from the latter.

At the conclusion of the preceding trials, therapeutic doses of 25 gm. were administered to the seven principals. One week later similar doses were given to the two controls.

Throughout the period of observation, daily milk samples of 15 to 20 cc. were obtained from each of the participating goats. The samples were collected in sterile milk tubes fitted with sterile rubber stoppers, and were kept in a refrigerator for one week before they were discarded. Twice each day (once on Saturdays and Sundays) the stoppers were removed from the tubes for a few minutes in order to permit aeration of the milk. Each tube was inverted several times before it was returned to the refrigerator. At the end of the holding period, the samples were poured into Petri dishes and exposed to the air for approximately six hours. Notations were made daily of the color of the milk, and the final reading was made before the samples were discarded.

Following therapeutic doses of the drug, half of each daily milk sample was immediately poured into a Petri dish and exposed to the air; the remaining portion was handled as described above. After six hours' exposure at room temperature, the former portions were placed in a refrigerator and kept until the

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†The authors wish to thank Dr. C. A. Manthei of the Animal Disease Station for providing the animals used in these investigations.

daily samples retained their normal appearance following exposure to air. No difference was noted in the discoloration which developed with the two methods of aerating the samples.

Several months after the foregoing trials were terminated, goat 800, nursing twin kids, was given a maximum therapeutic dose of 35 gm. of phenothiazine. The drug was given in the morning after the initial milk sample was obtained, and the first post-treatment specimen was collected seven hours later. Subsequent samples were collected twice daily for four consecutive days, the afternoon samples being collected seven hours after the morning milking. The kids were separated from the dam throughout the experimental period and were permitted to nurse only after each milk sample was obtained. Afterwards, the udder was stripped by hand but only insignificant amounts of milk remained. The milk was collected in sterile milk tubes, stoppered, and stored in a refrigerator until all samples had been collected. All specimens were poured into Petri dishes and exposed to the air at room temperature for 24 hours. The samples were then returned to the milk tubes, stoppered, and stored in the refrigerator for eight days. At the conclusion of this period, the samples were poured into Petri dishes and exposed to the air for five hours at room temperature. All milk samples, including a fresh specimen, were then tested with litmus paper and discarded.

Observations

Small Daily Doses (Table 1): A very slight or slight pinkish tinge developed in 41% (44) of the 105 daily milk samples obtained from the group receiving 1 gm. of phenothiazine per day. The majority (34) were judged to be very slightly pink, a degree of discoloration detectable only when the sample was compared closely with the controls. The first sample which developed discoloration was collected on the morning of the third day, or after two 1-gm. doses of phenothiazine had been administered. The subsequent daily milk samples collected from this animal became very slightly or slightly off color on all except six days. Milk from a second goat in this group exhibited an off color in 15 of the 35 samples, the first discolored sample occurring one day later than in the previous case. Only two samples were judged to be slightly pink; the other 13 were considered of lesser hue. No discoloration was detected in 34 of the daily samples collected from the third goat in this group. The only off-color sample, collected after 30 1-gm. doses of the drug had been administered, was judged to be very slightly pink.

In the aggregate, only 18% of the 45 milk samples obtained from the animals on the 0.5-gm. regimen developed an off color; and in each instance the milk was only very slightly pink. The first tinted sample at this dosage occurred on the sixth day; four subsequent samples from this animal developed a similar discoloration. Only three samples collected from a second goat in this group developed a very slight pinkish tint; the first sample to become discolored was collected on the ninth day. No discoloration developed in any of the samples collected from the third goat in this group.

In all, 27 of the 30 milk samples collected from goats receiving 2 gm. per day developed an off color. The discoloration varied from very slightly pink to pink, but only one sample was included in the latter category. In each instance, the discoloration developed in the first sample collected after the 2-gm. regimen was initiated. It should be noted, however, that one goat received somewhat more than 2 gm. the first day because a second capsule was given after the first was crushed in the mouth and expelled.

When the dosage was increased to 3 gm. per day, all specimens developed discoloration varying from very slightly pink to pink. In the aggregate, 86% (26) of the samples were slightly pink or pink, discoloration being detectable without the aid of control specimens.

Therapeutic Doses (Table 2): The discoloration of milk following therapeutic doses of 25 gm. of phenothiazine was quite marked. Of the milk samples collected the first day after treatment, five became very pink, three became pink, and one became slightly pink on exposure to air for six hours. The intensity of discoloration decreased considerably in samples collected on the second day, and, with one exception, all specimens were virtually normal on the third day. Very close examination revealed two others (32 and 39), which appeared to be slightly different from the controls, but the different appearance could not be definitely termed a pinkish discoloration. None of the specimens obtained from control animals showed discoloration at any time. In the aggregate, therefore, the milk of eight of the nine animals resumed an essentially normal appearance after two days, and milk from the other goat was apparently normal one day later.

In the case of goat 800, which had been given a 35-gm. dose of phenothiazine, maximum discoloration of the milk did not occur

TABLE 1. EFFECT OF SMALL DAILY DOSES OF PHENOTHIAZINE ON THE COLOR OF GOAT MILK

TABLE 1. EFFECT OF SMALL DAILY DOSES OF PHENOTHIAZINE ON THE COLOR OF GOAT MILK

Goat No.	Wt. lbs.		Doses of phenothiazine administered and date of milk samples collected: June 6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	July 1	2	3	4	5	6	7	8	9	10	11
30	60	Phenothiazine								0.5 Gm. daily												2.0 Gm. daily														
		Disc. of milk	–	–	–	–	–	–	–	–	+	–	–	+	–	–	–	–	+	+	+	++	++	++	++	++	+	++	++	++	++	++	++	++	++	++	++	++
32	60	Phenothiazine								0.5 Gm. daily					(b)																						
		Disc. of milk	–	–	–	–	–	+	–	+	–	–	–	+	–	–	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
43	60	Phenothiazine																				2.0 Gm. daily															
		Disc. of milk																		–	+	+	+	++	++	++	++	++	++	++	++	++	++	++	++	++	++	++
12(a)	65	Phenothiazine (c)								0.5 Gm. daily								(d)				2.0 Gm. daily															
		Disc. of milk	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	+	+	–	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
8(a)	70	Phenothiazine																				1.0 Gm. daily															
		Disc. of milk	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
		Phenothiazine																				1.0 Gm. daily															
38(a)	60	Disc. of milk	–	–	–	+	–	–	–	–	–	–	–	–	–	+	–	+	+	–	+	–	–	–	–	–	–	–	+	–	+	–	+	–	+	–
		Phenothiazine																				1.0 Gm. daily															
36	60	Disc. of milk	–	–	+	++	++	++	++	++	++	++	++	++	+	–	–	+	+	+	+	–	+	+	+	+	+	+	+	+	+	+	+	+	+	–	–

Two control samples obtained daily throughout the entire experimental period showed no discoloration at any time.

(a) Nursing twins.
(b) Substituted goat 43.
(c) Capsule crushed, most of drug retained.
(d) Capsule crushed and expelled; gave another 2.0 gm. capsule.
(e) Capsule crushed, small amount of drug not retained, June 24.
(f) Capsule crushed and expelled; gave another 3.0 gm. capsule.

Legend:
– No discoloration.
+– Slightly different from controls but not a definite pinkish discoloration.
+ Very slightly pink, a degree of discoloration discernible only when specimen is carefully compared with normal, or control, specimen.
++ Slightly pink, color detectable without the aid of control specimens, but readily apparent when comparisons are made.
+++ Pink, color readily apparent without resort to comparisons.
++++ Very Pink, same as +++ except more intense discoloration.

until approximately 20 hours after exposure to the air. At this time the samples collected seven, 24, 31, 48, and 55 hours after treatment were pink, very pink, very pink, pink, and slightly pink, respectively; all other specimens were apparently normal. The sample collected seven hours after treatment remained normal for at least 18 hours, but it had a very definite pink coloration two hours later. After subsequent storage in the refrigerator for 24 hours, the samples collected 24 and 31 hours after treatment retained their very pink color, but the other specimens showed no discoloration whatever. During the ensuing seven-day period, the intensity of discoloration of the 24 and 31-hour samples diminished progressively daily. No discoloration was detectable in the 31-hour sample after six days; and the 24-hour sample was virtually normal two days later. When the samples were again exposed to the air in open Petri dishes, a pinkish discoloration developed in some of the samples within three hours. The seven, 24, 31, and 48-hour specimens were slightly pink, pink, pink, and very slightly pink, respectively. The color disappeared from the 48-hour specimen after five hours' exposure. All samples, including the fresh specimen, gave a slightly acid reaction to litmus paper.

Discussion

Although circumstances did not permit us to conduct this investigation precisely as a free-choice regimen would be employed in a herd of commercial dairy goats, the apparent indications are of considerable interest and practical significance.

The findings indicate that milk from animals receiving 2 or 3 gm. of phenothiazine daily almost invariably develops a pinkish tint when exposed to the air for several hours. The intensity of the discoloration varies somewhat, especially with the lower dosage, but the milk is definitely off color in most instances. With daily doses of 0.5 and 1 gm., however, discolored milk occurs less frequently and the discoloration is of lower intensity. Indeed, with the smaller doses the discoloration is generally detectable only when the milk is compared closely with a control specimen. Moreover, with these small doses there is marked variation in the frequency with which discolored milk develops, and this skew occurrence may be of some practical importance. Since the milk from a herd of dairy goats is ordinarily pooled after collection, the significance of slightly discolored milk from an occasional animal is largely minimized by dilution.

. Although the frequency and intensity of discoloration are attributable primarily to the amount of phenothiazine administered, another important factor in this regard is milk production. This is indicated by the data in table 1. Since it may be reasonably assumed that a goat nursing twins produces more milk than one with only a single kid to support, milk from the latter doe would be expected to develop a more pronounced discoloration from similar doses of phenothiazine. Indeed, with both the 0.5 and 1 gm. daily doses of the drug, the intensity of discoloration, when present, was generally more pronounced in the milk of dams with single kids. Moreover, the discoloration developed more frequently in milk from animals nursing single offspring. With the larger dosage, differences in the frequency and intensity of discoloration between the two animals with twins may be attributable to a difference in milk production of the dams. With daily doses of 2 and 3 gm., the influence of milk production on the intensity of discoloration was less evident.

Following the administration of therapeutic doses of the drug, milk collected on the first day shows a marked pinkish discoloration when exposed to the air. The intensity of the discoloration is considerably reduced on the second day, and, in most cases, is apparently nil thereafter. This discolored milk is not suitable for distribution through commercial channels for human consumption although there is no evidence that it is harmful in any respect. Since this milk must be discarded or fed to other animals, it is economically advantageous for the producer of goat milk to return treated animals to the milk line as soon as possible. As shown in table 2, the milk of nine of ten goats developed no discoloration after the second day, and milk from the other animal was apparently normal after the third day. The persistence of the derivative in the milk of the latter may be attributable to a difference in the method of milking. This animal was nursed exclusively by an orphan kid, and the milk sample was collected before the morning feeding, an interval of at least 18 hours after the previous meal. The other animals, except goat 800, were nursed by their offspring at will, and, as a consequence, milk containing the derivative was more promptly removed.

As in the case of small daily doses of phenothiazine, there is some variation in the intensity of the discoloration which develops in the milk following the administration of therapeutic doses of the drug. As noted previously, this variation is probably ascribable to differences in milk production although the data in this regard are more suggestive than conclusive. The persistence of the discoloration, on the other hand, is apparently rather uniform; for in the majority of cases, milk drawn on the third day after treatment does not become discolored. This was true also in the single instance in which a 35-gm. dose was given.

Although a number of phenothiazine derivatives have been isolated from the alimentary tract and from various body fluids of several classes of animals, the chemical identity of the excretion products which occur in the milk has not been definitely established. It is evident, however, that they occur as colorless compounds in freshly drawn milk and that they are converted to red dyes only after exposure to air. The oxidation products, however, are apparently relatively unstable since the color disappears after a variable period of time. The factors responsible for the reduction reaction are unknown, but the reaction apparently is not dependent upon a change in the pH of the milk.

TABLE 2. EFFECT OF THERAPEUTIC DOSES OF PHENOTHIAZINE ON THE COLOR OF GOAT MILK.

Goat Number	Weights (lbs.)	Date Treated	Discoloration of Milk (days after treatment)		
			1	2	3
39	60	7-11	++++	++	√
7(a)	75	7-18	++++	+++	++
32	60	7-11	++++	++	√
43	60	7-11	++++	+	−
12	65	7-11	+++	+	−
8	70	7-11	++	+	−
38	60	7-11	++++	+	−
48	45	7-18	+++	++	−
36	60	7-11	+++	+	−
800(b)	60	11-7	++++	+++	−

Legend: See table 1.
All samples were normal on the 4th, 5th, 6th, and 7th days.
(a) Nursed orphan kid.
(b) Received 35-gm. dose, all others 25-gm. doses.

Although the data are limited, the over-all evidence tends to support the view that, insofar as discoloration of milk is concerned, a regimen of free-choice administration of phenothiazine in salt which limits the ingestion of the drug to a maximum of 1 gm. daily should be satisfactory for dairy goats. Presumably, an average intake of half this amount is adequate for efficient parasite control. Moreover, the evidence indicates that the milk is probably usable again for human consumption 72 hours after the administration of therapeutic doses of the drug.

(*Continued on page* 372)

Immunization Of Chicks Hatched From Hens Immunized Against Newcastle Disease*†

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IN a report by Brandly, Moses and Jungherr,[1] the subject of antibody transmission via the yolk to young chicks was reviewed and the relation of yolk-conferred antibody to Newcastle disease was discussed. It was shown that specific virus neutralizing antibody was present in the yolk of eggs laid by immune hens, that the embryo acquired specific neutralizing antibody during the later stages of incubation, and that absorption of the antibody continued after chicks were hatched. Also they showed that the yolk-conferred antibody protected chicks against infection with Newcastle disease virus, and that the passively conferred immunity interfered with active immunization.

By employing intranasal vaccination of day-old chicks with the B1 virus[2] at a hatchery in which an outbreak of Newcastle disease had occurred, it was observed that chicks hatched from hens recently recovered from the disease showed respiratory symptoms comparable to those seen in chicks from susceptible hens. Following this observation, experiments were conducted to determine if the B1 virus induced an immunizing reaction in parentally immune chicks. Results of preliminary trials on the immunizing reaction in chicks from immune hens will be discussed in this report.

I. Intranasal and Intramuscular Vaccination with B1 Virus at Three Days of Age

The chicks employed in this trial were obtained from a flock of White Leghorn hens approximately 50 days after a natural outbreak of Newcastle disease. Diagnosis was established in the hens with the hemagglutination inhibition (HI) test and the serum neutralization (SN) test. Mortality in the hens was approximately 5%. At three days of age, the chicks were divided into three groups. One group was isolated for control purposes, one was vaccinated intranasally with 0.05 cc. of B1 virus (amnioallantoic fluid) and the other group was vaccinated intramuscularly with 0.05 cc. of B1 virus.

Periodic HI tests were made on chicks from each group to determine if the vaccination caused demonstrable effect on the HI titers. Ten chicks were bled out for each testing period from the third to 21st days. Thereafter, blood samples were obtained from the wing veins of ten chicks in each group. Results of the HI test are shown in table 1 as average titers. There was a gradual fall of HI titer throughout the 27-day period in which the tests were made. Only a small difference was obtained in the average and individual titers for the three groups. The intramuscularly vaccinated group had titers averaging slightly higher than the controls and the intranasally vaccinated group averaged slightly higher than those vaccinated intramuscularly. If there was stimulation of the antibody-producing system of the chicks, it was not shown by an appreciable difference in the HI titers following vaccination. Symptoms of respiratory infection were present in the intranasally vaccinated group but were absent from the intramuscularly vaccinated chicks.

TABLE 1. AVERAGE HI TITERS OF PARENTALLY IMMUNE CHICKS VACCINATED WITH THE B1 VIRUS

Age of Chicks (days)	HI titers of unvac. controls	Days after vac.	HI titers intranasally vac. chicks	HI titers intramus. vac. chicks
3	40.0*			
7	96.0			
11		8	50.0	37.0
13		10	10.0	10.0
14	3.7			
15		12	6.7	3.5
18		15	6.5	3.5
21	2.5	18	4.5	2.5
27	2.5	24	4.5	3.0

*Highest serum dilution causing complete inhibition of agglutination.

At 34 days of age, chickens from the three groups were challenged by intratracheal ad-

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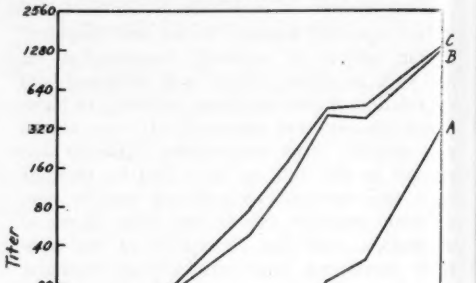
ministration of 0.1 cc. of AAF, representing approximately 10^6 embryo l.d.$_{50}$ of virus Ky-50. The vaccinated chickens were used as controls, sufficient time having elapsed for the yolk-conferred protection to have been dissipated. In the unvaccinated chickens, there were seven deaths from a group of 22. The remaining chicks became severely ill, stopped feeding, and lost considerable weight. In the intranasally vaccinated group, all of 29 chickens were refractory to lethal infection at 31 days following vaccination. None of the chicks developed nervous symptoms. Very slight and transient symptoms of respiratory infection occurred in a few chickens. Their activity, feed consumption, and growth were not discernibly affected. For the intramuscularly vaccinated groups, results of challenge exposure of 26 chickens at 31 days after vaccination were essentially the same as for the intranasally vaccinated chickens. Symptoms of respiratory infection were somewhat more prevalent in the group vaccinated intramuscularly. These chickens, however, showed no evidence of reduced feed consumption or activity.

Although there was no appreciable change in the HI titers following vaccination of the parentally immune chicks, the experience with the B1 virus obviously resulted in development of resistance to reinfection. Also, evidence of an immunizing reaction from the vaccination was obtained by following the development of the HI titers resulting from challenge exposure. The control group exhibited an average HI titer response characteristic of susceptible chicks having their first experience with Newcastle disease virus. The groups vaccinated intranasally and intramuscularly showed the characteristic anamnestic response that has been obtained in all groups of susceptible chicks which have been vaccinated with living virus and subsequently lost their HI titers. (Figure 1.)

II. Intranasal Vaccination with B1 Virus in Parentally Immune Chicks at Two and Nine Days of Age

The chicks employed in this study were obtained from a group of hens approximately six months following a natural outbreak of Newcastle disease. At the time the eggs were collected for hatching, the hens were quartered in individual compartments of laying batteries. Eggs and serum samples were obtained from each hen for virus neutralization tests. The neutralizing capacity of 0.05 cc. of 1:5 dilution of egg-yolk varied from $10^{3.66}$ to $10^{5.5}$ embryo l.d.$_{50}$ of virus Ky-127. The neutralizing titer of 0.05 cc. of serum was 10^6 embryo l.d.$_{50}$ or more in all of the hens. Chicks hatched from these hens of known immune status were vaccinated intranasally with the B1 virus at two and nine days of age. There was very little evidence of vaccination reaction in either group. A few chickens of each age showed

Figure 1.- HI Response Resulting from Intratracheal Challenge of Susceptible and Vaccinated Chicks at 34 Days of Age.



A.-Controls. Unvaccinated susceptibles.
B.-Vaccinated intranasally at 3 days of age.
C.-Vaccinated intramuscularly at 3 days of age.

symptoms of mild respiratory infection. Periodic determination of the HI titers of the different groups of chicks showed no difference between those vaccinated at two days of age and controls of the same age. With the chicks vaccinated at nine days of age, there was a demonstrable increase in HI activity of the serum at seven and 14 days following vaccination. (Table 2.). Although there was no demonstrable stimulation of the antibody-producing system of the two-day old chicks, challenge exposure with $10^{6.5}$ embryo l.d.$_{50}$ of the GB virus intramuscularly at 31 days following vaccination showed definite evidence of an immunizing reaction. This protection was evident in both total mortality and the time at which death occurred. (Table 3.). In the controls, chicks four weeks of age hatched from the same hens as the vaccinated groups, 35 of 36 chicks were dead on the third day following challenge exposure. In the chicks vaccinated at two days of age, less than 50% of the mortality occurred on the third day. As shown by results of the HI tests, table 2, the

stimulation of the antibody-producing system was greater in the nine-day old chicks, which may indicate that a stronger protective activity had been developed. The more efficient immunizing reaction at nine days of age was evident in results of challenge exposure at 31 days following vaccination. Mortality was approximately four times greater in the chicks vaccinated at two days of age. (Table 3.) Survivors that showed nervous symptoms were approximately the same in both groups. Surviving chicks from both groups showed the typical anamnestic response of HI titers which characterizes groups of chicks having previous experience with Newcastle disease virus.

TABLE 2. AVERAGE HI TITERS OF PARENTALLY IMMUNE CHICKS VACCINATED INTRANASALLY WITH B1 VIRUS AT TWO AND NINE DAYS OF AGE

Age of chicks (days)	HI titers control chicks	HI titers vaccinated 2 days old	HI titers vaccinated 9 days old
2	63.3*	.....	.....
9	18.3	8.3 (7)†	.....
16	6.2	9.0 (14)	16.0 (7)
23	2.5	2.5 (21)	76.0 (14)
30	3.7	2.5 (28)	3.7 (21)

*Highest serum dilution causing complete inhibition of agglutination.
†Figure in parentheses represents number of days following vaccination.

TABLE 3. RESULTS OF CHALLENGE EXPOSURE OF PARENTALLY IMMUNE CHICKS VACCINATED INTRANASALLY WITH THE B1 VIRUS AT TWO AND NINE DAYS OF AGE

Days following challenge exposure	Mortality resulting from intramuscular challenge with $10^{6.5}$ embryo $l.d._{50}$ of GB virus 31 days following vaccination		
	Controls, 4 weeks old	Vaccinated 2 days old	Vaccinated 9 days old
3	35	4	0
4	0	1	2
5	0	0	0
6	1	4	1
7 to 21	0	0	0
Total mortality	36	9	3
N.S. and P.*	0	5	7
Normal†	0	9	18
Killed (%)	100	39.1	10.7
N.S. and P(%)	0	21.7	25.0
Dead + N.S. and P (%)	100	60.8	35.7
Total chicks	36	23	28

*Chickens showing nervous symptoms and paralysis 21 days after challenge exposure.
†Chickens showing no symptoms referable to infection with Newcastle disease virus at 21 days after challenge exposure.

III. Immunizing Reaction Resulting from Challenge of Parentally Immune Chicks with Virulent Virus

The chicks employed for this study were hatched from the same hens employed in experiment II. All were known to have high virus neutralizing titers in their serum and egg-yolk. Three groups of chicks numbering 77, 78, and 20 for the respective ages of one, two, and three weeks, were challenged with virus Ky-50 for determining the refractivity to infection conferred by the yolk antibody. In previous experiments, virus Ky-50 had killed 50 to 60% of chickens three to four weeks of age. The lot of virus used in this experiment killed 30% of susceptible chickens seven weeks of age. The chicks of each group were exposed by intranasal instillation of 0.05 cc. of amnioallantoic fluid containing approximately 10^6 embryo $l.d._{50}$ of virus Ky-50. During 21 days following challenge, there were no deaths in the 77 chickens exposed at one week of age.

TABLE 4. IMMUNIZING REACTION FROM INTRANASAL CHALLENGE OF PARENTALLY IMMUNE CHICKS WITH VIRUS KY-50, AS INDICATED BY SUBSEQUENT CHALLENGE WITH GB VIRUS

Days following challenge with GB virus	Mortality resulting from intramuscular challenge with GB virus 48 days after exposure to virus Ky-50			
	Controls 7 weeks old	Exposed Ky-50 1 week old	Exposed Ky-50 2 weeks old	Exposed Ky-50 3 weeks old
3	18	14	5	0
4	10	4	4	1
5	1	0	0	0
6	3	5	2	0
7 to 21	2	1	1	0
Total mortality	34	24	12	1
N.S. and P*	1	8	4	0
Normal†	0	38	59	19
Killed (%)	97.1	34.3	16.0	5
N.S. and P (%)	2.9	11.4	5.3	0
Dead + N.S. and P (%)	100	45.7	21.3	5
Total chicks	35	70	75	20

*Chickens showing nervous symptoms and paralysis 21 days after challenge exposure.
†Chickens showing no symptoms referable to infection with Newcastle disease virus at 21 days after challenge exposure.

Two of the group developed torticollis and were killed on the 18th day. In the 78 chicks exposed at two weeks of age, one died and one developed nervous symptoms. There were no deaths or nervous symptoms in the group exposed at three weeks of age. There were symptoms of mild respiratory infection in some chicks in each of the three groups. Except for the chicks that died, there were no cases of severe illness. There was no obvious effect on activity and feed consumption.

At 48 days following exposure to virus Ky-50 the three groups were challenged intramuscularly with 10^6 embryo $l.d._{50}$ of the GB virus. Results of the second challenge are summarized in table 4. Lethal infection and nervous symptoms occurred in 100% of 35 susceptible controls seven weeks of age. Symptoms of respiratory infection were almost entirely absent following intramuscular challenge

with the GB virus. This virus is highly pathogenic and appears to be strongly neurotropic. Nearly all of the cases of fatal infection were due to rapidly developing paralysis. Some paralyzed chickens, however, live for several days before death occurs. By interpreting results of the challenge with the GB virus as protection against lethal infection or symptomatic infection of the nervous system and the absence of symptomatic systemic illness, 54.3% of the parentally immune chicks exposed to virus Ky-50 at one week of age were immunized. Similarly 78.7% of the parentally immune chicks were immunized by exposure to virus Ky-50 at two weeks of age and 95% were immunized by exposure at three weeks of age.

IV. Immunization Reaction of Day-Old Chicks from Hens Vaccinated with B1 Virus

The chicks employed in this study were hatched from eggs obtained approximately five months after intranasal vaccination of the hens with the B1 virus at ten weeks of age. The parental immunity status of comparable chicks was sufficient to protect approximately 50% against lethal infection from contact exposure with other chicks inoculated with the GB virus. For this experiment, 57 chicks were vaccinated intranasally with 0.05 cc. 10^6 embryo $l.d._{50}$ of AAF virus Ky-2. This virus is of relatively low pathogenicity, being incapable of causing lethal infection in chicks three weeks of age. Its pathogenicity for day-old susceptible chicks has not been determined. During the first 21 days following intranasal instillation of virus Ky-2, eight chicks died and three developed nervous symptoms. The surviving chicks nearly all showed evidence of respiratory infection. When the chickens were 54 days of age, 35 were selected for challenge exposure and inoculated intranasally with 10^6 embryo $l.d._{50}$ of the GB virus. The average HI titer for the group was 1:5 two days before exposure. Of this group two chickens died on the fourth day following exposure. There were no additional deaths and none of the chickens developed nervous symptoms during an observation period of 18 days. Symptoms of mild respiratory infection occurred in some of the chicks.

Another group of day-old chicks from the same hens was subjected to contact exposure with other chicks inoculated intranasally and intramuscularly with the GB virus. The contact exposure resulted in death of 45% of the chicks. Of the surviving chicks, 24 were selected and exposed intranasally with 10^6 embryo $l.d._{50}$ of GB virus at 51 days of age. None of the chicks died nor showed evidence of infection of the nervous system. A few showed very mild symptoms of respiratory infection.

For control purposes, a group of 54 susceptible chickens nine weeks of age were inoculated intranasally with 10^6 embryo $l.d._{50}$ of GB virus. Of these, 46 died, four developed nervous symptoms which persisted at 18 days following exposure, and four developed systemic illness from which they recovered.

Discussion

The data obtained in this study show that an immunizing reaction results from exposure of parentally immune chicks to living Newcastle disease virus. It appears that the yolk-conferred protection does not prevent infection of newly hatched chicks, but causes a variable modification of the infection that does occur. In experiments for determining the refractivity to lethal infection acquired from yolk-transferred antibody, chicks have shown extreme variation in symptoms. With a highly pathogenic virus, GB strain, chicks from a selected group of immune hens have had all degrees of infection from asymptomatic to that which results in death. Similar chicks challenged with viruses of moderate or low pathogenicity showed no evidence of infection or very mild respiratory symptoms. The highly pathogenic virus apparently served as a more critical indicator of the quantitative value of the yolk-conferred protection. Evidence that infection had occurred in surviving chicks which showed no symptoms was obtained from the HI response resulting from subsequent challenge exposure. Daily testing for establishing the HI response showed that the increase in HI antibody occurred earlier and reached the maximum level sooner than in susceptible chicks of comparable age. Susceptible chicks which had been vaccinated with living virus and subsequently lost demonstrable HI antibody showed the same anamnestic response. Also, the immunizing reaction resulting from exposure of parentally immune chicks was shown by their refractivity to lethal infection, to symptomatic infection of the nervous system and to symptomatic systemic infection upon subsequent challenge with virulent virus.

The immunity resulting from intranasal vaccination with the B1 virus was quite uniform in experiment I in which the challenge virus was Ky-50. For a similar group of chicks in experiment II, immunity against challenge with the GB virus was less effective. Although somewhat higher mortality may be expected from intramuscular challenge, the difference

was due primarily to the higher pathogenicity of the GB virus. The failure of some chicks to become immunized against lethal infection probably resulted from the degree of protection provided by the yolk antibody. If present in sufficient quantity, the yolk antibody may so limit the vaccination infection that an enduring immunity is not produced. Variables in the passive protection afforded the young chicks result from the amount of antibody present in the yolk and the rate of absorption of the yolk. As indicated by the results of challenge exposure, chicks hatched from hens vaccinated with the B1 virus have a low amount of passively transferred antibody. These chicks were immunized more efficiently than chicks hatched from hens that underwent natural infection and maintained high levels of virus-neutralizing antibody.

Parentally immune chicks were immunized more effectively by intranasal vaccination with the B1 virus at nine days of age than similar chicks vaccinated at two days of age. Intranasal exposure of parentally immune chicks with virus Ky-50 at the ages of one, two, and three weeks resulted in more effective protection with increasing age of the chicks. The more effective immunity in the older chicks apparently resulted from loss of the passively transferred antibody permitting more extensive infection with the vaccine virus. Also it is probable that the antibody-producing system functioned more efficiently in the older chicks. By employing frequent HI testing following vaccination of two or three-day old parentally immune chicks, it was not possible to show any demonstrable stimulation of the antibody producing system. With chicks nine days old, however, there was an increase in HI activity of the serum at the seventh and 14th days following vaccination.

Summary

An immunizing reaction occurred in parentally immune chicks at all ages from one day upward following intranasal instillation of living Newcastle disease virus.

The degree of immunization appeared to be influenced by the amount of yolk-transferred antibody, the age of the chicks, and the virulence of the virus.

Chicks hatched from hens having high virus neutralizing titers in the serum and egg-yolk were not uniformly immunized against lethal infection with the highly virulent GB virus.

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2. Hitchner, S. B., and Johnson, E. P., A Virus of Low Virulence for Immunizing Fowls Against Newcastle Disease (Avian Pneumoencephalitis). *Vet. Med.*, 43:525, 1948.

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Ascites and Edema in Turkey Poults

Mortality in turkey poults under three weeks of age has been shown by Bigland (*Canad. Jour. Comp. Med.*, April 1950) to be due to excessive intake of sodium chloride (NaCl) in feed and water.

Losses generally started when the birds were eight or nine days of age, increased to the eighteenth day of age and thereafter tapered off. Few losses were noted after poults reached 21 days of age. Deaths in most cases were reported by growers as occurring without symptoms. Others noted dizziness, swollen abdomens, excessive water consumption, and inappetence. Losses averaged from 10% to 20% of broods. Autopsy finding included excessive pericardial fluid, with cardiac enlargement, edema of the lungs and intestinal wall, inflammation of the duodenum, ascites and anasarca.

A series of chemical tests on commercial mixed feed used revealed quantities of salt, ranging from 0.77 to 2.36% as sampled from feed bags. Manufacturers stated that from 0.5 to 1% only had been added. The increase was thought to be due to salt-containing ingredients of the feed such as fish meals and tankage. Samples of feed from troughs indicated a range of salt content from 1.19 to 2.56%, due to salt gravitation. This high salt content of feed with water of the region also high in salt, proved toxic for younger poults.

The author expresses the opinion that feed manufacturers should compound their starter mashes for both chickens and poults on the basis of total sodium chloride recommended for optimal nutritional levels. Growers are cautioned to mix thoroughly added ration to troughs to prevent salt build up. Also, to assure by analysis the salt content of water given poults so that optimum intake levels can be computed and adjusted.

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Cattlemen in Sonora state, Mexico, have contracted for the sale of 3,000,000 lb. of frozen beef to the United States Commodity Credit Corporation, to be sent to Europe.—*Nat'l Prov.*

The Efficacy Of Lead Arsenate For The Common Tapeworm Of Sheep*

BANNER BILL MORGAN, Ph.D., ARTHUR POPE, Ph.D., and DALE K. SORENSEN, D.V.M., M.S., Madison, Wisconsin

RECENT studies by Allen and Jongeling[1] on the use of lead arsenate against the common sheep tapeworm *Moniezia expansa* indicated high efficacy at the 1 gm. level. Foster and Habermann,[2] reviewed the literature on this subject and concluded that lead arsenate treatment was safe and effective for removal of common sheep tapeworms. However, this work emphasized the need for further information on whether lead or arsenic were deposited in the tissues of treated animals, and to determine whether a 1 gm. dose of the drug provided a reasonable margin of safety.

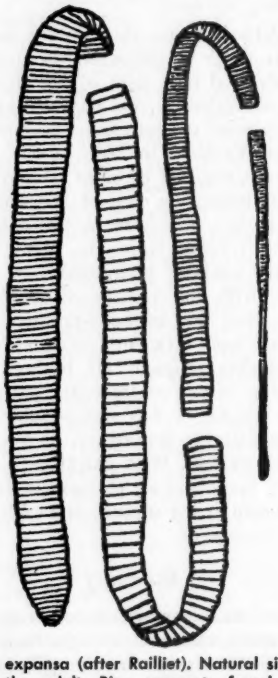
The purpose of this paper is to report findings on 30 lambs which were used in tests of the efficacy of treatment for the removal of *M. expansa* with 0.5 gm. and 1 gm. doses of lead arsenate administered in gelatin capsules.

Materials and Methods

The lambs harboring the common sheep tapeworm were obtained from a flock native to southern Wisconsin. These lambs were approximately five months of age and had been pastured for three months with other sheep under ordinary farm conditions. Infected animals were selected by demonstrating tapeworm eggs or segments in fecal samples examined by routine flotation methods.

Animals were held several days before treatment and fed a balanced ration of alfalfa hay, corn and oats. The 30 lambs were divided into two equal lots and kept in pens having concrete floors. The first group was segregated at random, with one animal per pen. Five of the animals served as untreated controls. The remaining ten were selected at random and five were given 0.5 gm. and five 1 gm. of lead arsenate. The drug was weighed carefully, placed in gelatin capsules and administered with a balling gun. The lead arsenate used was of a commercial grade (98% active ingredient).

The second group of 15 animals served to replicate the first experiment since they were handled in the same manner. There was a time interval of two weeks between the two trials.



Moniezia expansa (after Railliet). Natural size portions of the adult. Ripe segments found in the feces are whitish to yellowish and resemble rice grains.

After treatment, feces of each animal were collected immediately upon elimination and examinations were made in the laboratory within an hour. A dissecting microscope and screens ranging from eight to 40 mesh were utilized in the examination. The tapeworm specimens were recovered and scolices counted. Fecal collections and examinations, together with observations on the physical condition

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of the animals, were continued to the time of sacrifice of the animals five to six days later. Individual weights were taken on the lambs on the day of treatment and the day of slaughter.

All animals were identified by ear tags and were slaughtered at the local abattoir. Carcasses were graded by a federal inspector the day following. Viscera of each animal were saved, identified and taken to the laboratory. After removal of the large portions of tapeworms, the entire intestinal tract was cut into two to three foot lengths and thoroughly flushed into individual containers. The contents were screened and examined with a dissecting microscope, and various organs examined for gross pathological changes.

TABLE I. ACTION OF LEAD ARSENATE TREATMENT IN REMOVING MONIEZIA EXPANSA FROM SHEEP IN GROUP 1.

Sheep No.	Treatment Lead Arsenate (gm.)	Scolices No. Elim.	Scolices No. Remain.	Scolices Total No. Present	% Efficacy
799	0	0	8	8	0
796	0	0	1	1	0
980	0	0	16	16	0
792	0	0	13	13	0
789	0	0	74	74	0
988	1	1	0	1	100
798	0.5	3	2	5	60
777	1	2	0	2	100
785	0.5	3	1	4	75
781	1	0	0	0	....
790	1	23	0	20	100
787	1	10	0	10	100
986	0.5	10	0	10	100
779	0.5	0	0	0	—
780	0.5	2	10	12	16.6

Efficacy, 1 gm. 100%; 0.5 gm. 62.9%; average for group 81.4%.

Results

Results are summarized in tables I and II. The treatment of group 1 gave an 81.4% efficacy. A total of 54 worms was expelled following treatment. A total of 13 tapeworms was recovered at autopsy from three of the sheep. The 1 gm. treatment gave a 100% efficacy in contrast to 62.9% following treatment with 0.5 gm. doses of lead arsenate.

In group 2, 66 tapeworms were removed and 11 were recovered at autopsy from three sheep. The average efficacy was 86%. In this group, 1 gm. doses removed 100% of the worms while 0.5 gm. doses removed 68.5% of the total parasites.

In control group 1, 112 tapeworms were recovered at autopsy and none were expelled during the test period. The number of worms harbored by the controls in group 1 ranged from one to 74 per animal. In control group 2, 31 tapeworms were recovered at autopsy and none were eliminated. The number of worms ranged from one to 23 per animal. Neither toxic symptoms nor gross lesions due to lead arsenate were observed during the test.

Discussion

There did not appear to be any correlation between the weight of the lambs and the degree of tapeworm infection (table III). The carcasses of ten lambs graded "U. S. Good," 16 "U. S. Commercial" and four "U. S. Utility." The average number of tapeworms per lamb of the respective grades was six, 12 and five. Since carcass grades of lambs are determined quite largely on the amount of fat present it is interesting that on this basis the utility grade did not have as many tapeworms as the good grade lambs. Apparently, in these particular lambs, tapeworms were not responsible for the variation in condition.

In both trials, the control lambs gained weight over the six-day experimental periods. The group 1 lambs treated with 0.5 gm. capsules lost three pounds while group 2 gained three pounds. One group of lambs receiving the 1 gm. dose lost six pounds while the second group lost ten pounds.

It appears logical to expect that the untreated or control lambs would gain weight and that the weights of the lambs treated with 0.5 gm. could be considered normal. There was a slight difference in loss of weight during observation period between the lambs treated with 0.5 gm. and 1 gm. doses; the latter group lost more weight following treatment. However, much of the loss of weight in the lambs receiving the larger dose was

TABLE II. ACTION OF LEAD ARSENATE TREATMENT IN REMOVING MONIEZIA EXPANSA FROM SHEEP IN GROUP 2.

Sheep No.	Treatment Lead Arsenate (gm.)	Scolices No. Elim.	Scolices No. Remain.	Scolices Total No. Present	% Efficacy
788	0	0	2	0	0
794	0	0	23	23	0
990	0	0	1	1	0
778	0	0	4	4	0
795	0	0	1	1	0
979	1	6	0	6	100
797	0.5	3	5	8	37.5
784	1	3	0	3	100
791	0.5	17	0	17	100
793	1	1	0	1	100
782	0.5	33	5	38	86.8
985	1	1	0	1	100
783	0.5	1	1	2	50
786	1	1	0	1	100
984	0.5	0	0	0	—

Efficacy, 1 gm. 100%; 05 gm. 68.5%; average 86.0%

accounted for by excessive loss in one animal (sheep 786). The appetite of test animals was not affected by either dosage rate.

Summary

Thirty lambs harboring the common sheep tapeworm *Moniezia expansa* were divided into two equal lots. Each lot was segregated with one animal per pen. Ten lambs served as untreated controls. Ten animals were given 0.5 gm. and ten lambs received 1 gm. of lead arsenate in gelatin capsules. The average percentage of efficacy of the treatment in the two lots was 81.4 and 86%. In both lots, the 1 gm. treatment removed 100% of the tapeworms while the 0.5 gm. dose caused 62.9 and 68.5% to be eliminated. Symptoms or lesions which could be attributed to lead arsenate were not observed. However, more information is desired on the safety, optimum doses, and cumulative toxic action of lead arsenate.

TABLE III. DATA ON CARCASS GRADES OF SHEEP TREATED WITH LEAD ARSENATE.

Sheep No.	Live Wt. (Lb.)	Weight Gain or Loss (Lb.)	Dressed Wt. (Lb.)	U.S. Grade	Treatment
799	68	—3	28	Com.*—	Untreated Controls
796	76	+6	36	Util.**+	
980	70	0	31	Util.+	
792	62	+3	29	Com.—	
789	69	0	32	Com.+	
788	75	—3	36	Good+	
794	87	+1	40	Good	
990	56	0	26	Com.	
778	93	+4	44	Good	
795	77	+4	33	Util.+	
798	76	0	40	Good+	0.5 gm. lead arsenate
785	72	—3	34	Com.+	
986	71	—1	36	Com.+	
779	61	—1	28	Com.—	
780	72	+2	35	Good—	
797	75	—1	32	Com.+	
791	63	+4	35	Good+	
782	72	+3	33	Com.+	
783	67	—1	33	Good—	
984	76	—2	35	Com.	
988	60	—5	25	Util.	1 gm. lead arsenate
777	69	+1	33	Com.+	
781	81	—1	39	Good—	
790	74	—3	34	Com.+	
787	66	+2	30	Com.+	
979	68	+1	32	Good—	
784	72	+2	36	Com.+	
793	80	—4	36	Good—	
985	75	—1	35	Com.+	
786	70	—8	29	Com.+	

*Com. = Commercial; **Util. = Utility

Acknowledgment

The writers wish to thank the Oscar Mayer Packing Company, Madison, Wis., for making available certain facilities necessary for this work. Thanks are also due to Mrs. Katherine Leffler, formerly of the Department of Veterinary Science, University of Wisconsin, for certain technical aid.

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2. Foster, A. O. and Habermann, R. T., Lead Arsenate for Removal of Ruminant Tapeworms. *Jour. Am. Vet. Med. Assn.*, 113:51, 1948.

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The Effect of Therapeutic and Small Doses of Phenothiazine on the Color of Goat Milk

(*Continued from page* 364)

Abstract Summary

In limited trials with nursing goats, milk from animals receiving 2 or 3 gm. of phenothiazine daily almost invariably developed a pinkish discoloration when exposed to the air for several hours. With daily doses of 0.5 and 1 gm., however, discoloration occurred less frequently, and it was generally detectable only when the milk was compared closely with a control sample. Insofar as discoloration of milk is concerned, therefore, a regimen of free-choice phenothiazine therapy which limits the ingestion of the drug to a maximum of 1.0 gm. daily should be satisfactory for dairy goats. Following therapeutic doses of the drug, the milk of nine of ten goats resumed an essentially normal appearance after two days, and milk from the other animal was apparently normal one day later. The milk, therefore, is usable again for human consumption 72 hours after the administration of therapeutic doses of the drug. Variations in the intensity of discoloration among individual animals receiving similar doses of the drug apparently were due to differences in milk production.

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Larger Spring Pig Crop

Farmers raised 60,079,000 pigs this spring, 3% more than a year ago and except for 1942 and 1943, more than any other year of record, according to the June pig report of the Bureau of Agricultural Economics.

Trend toward earlier farrowings continued this spring and because of more than normal cold, stormy spring weather, the number of pigs saved per litter is estimated at 2% less than last year and only slightly above the ten-year average.—*Agr. Sit.*

EDITORIAL COMMENTS

Calfhood Vaccination for Brucellosis Control In California

The brucellosis control program in California based on vaccination of calves has now been in operation for 2½ years. During the half year just concluded, January to June inclusive, 1950, the largest number of calves were vaccinated than in any other six months' period. Good progress has been made in improving the operation of the program and it is believed that vaccinations are more closely approximating 100% of the eligible calves in the state.

Vaccinations generally are made by accredited practicing veterinarians, who have contracts for this work with the Division of Animal Industry, California Department of Agriculture. The state furnishes the vaccine and pays the veterinarian 75 cents for each calf vaccinated. The vaccination service, however, is entirely free to owners.

The law on brucellosis control requires the vaccination of all female dairy calves. It also provides for optional vaccination of male dairy calves and beef type calves on request of owners. Only calves between the ages of six and 12 months are eligible for vaccination.

It is reported that the calf vaccination program appears to be showing favorable results.

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Foot-and-Mouth Disease Activities in Mexico

Vaccine production activities ceased in Mexico on April 13, 1950, after a cumulative total of 53,124,000 doses were manufactured by the joint Mexican-United States Commission. With a total of 1,644,619 doses purchased, 54,768,619 doses were made available in Mexico for use during the vaccination program.

Third vaccinations are being completed in the center of the quarantine zone, according to USDA Report No. 23. Fourth vaccination will be continued through July. In those areas where vaccine protection is wearing off, possibility of outbreaks exists. Inspection brigades, permanently assigned to districts, are making continuous survey and examination for evidence of the disease. None has been reported since the December 1949 outbreak in the state of Jalisco.

Washington School a Separate Unit

Announcement by the President, State College of Washington, states that the College of Veterinary Medicine, formerly a unit under the Institute of Agricultural Sciences, will henceforth be considered a professional unit under a deanship directly responsible to the President of that institution.

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Dr. W. M. Coffee, La Center, Ky., who will be installed as the 72nd president of the A.V.M.A. at the closing session of the Miami Beach convention.

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Following a recent conference of fur animal breeders and others, Dr. B. T. Simms, Chief of the BAI, appointed a committee to investigate the cause of increasing numbers of breeding failures reported in farm raised mink. Until conclusive information is available, mink breeders are advised to avoid feeding poultry waste containing heads of birds treated with stilbestrol implants, particularly to young animals that are to be raised as replacements for breeding stock and mature male and female mink.

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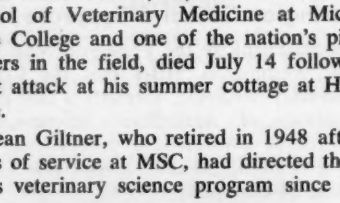
About 60% of Army officers on duty today are 35 years of age or under, and half of the enlisted men are 21 or under. As a matter of fact, the average age of enlisted men is only 22, and that of officers is 34.—*Gordon Gray, Sec. of the Army.*

Dean Ward Giltner Dies of a Heart Attack

Dr. Ward Giltner, 68, dean-emeritus of the School of Veterinary Medicine at Michigan State College and one of the nation's pioneer leaders in the field, died July 14 following a heart attack at his summer cottage at Higgins Lake.

Dean Giltner, who retired in 1948 after 40 years of service at MSC, had directed the college's veterinary science program since 1923.



Dr. Ward Giltner

He was the college's second veterinary dean, heading the school for 24 of the 41 years since its establishment, and preceded the present dean, Dr. Claude S. Bryan. The school was instituted as the tenth of its kind in 1909.

After joining the MSC staff in 1908 as a research assistant in bacteriology, Dean Giltner was appointed professor of bacteriology in 1912, and in 1923 took over the Division of Veterinary Science. In 1944, the curriculum was greatly expanded and the name changed to the School of Veterinary Medicine.

Born in Ithaca, N. Y., April 5, 1882, Doctor Giltner received his D.V.M. degree from Cornell University, his M. S. from Alabama Polytechnic Institute at Auburn, and his doctor of public health degree from the University of Michigan.

Dean Giltner was a member of numerous professional organizations including: American Academy of Arts and Sciences, American Public Health Association, American Chemical Society, American Veterinary Medical Association, U. S. Livestock Sanitary Association, Society of American Bacteriologists, Association of American Pathologists and Bacteriologists, and Michigan Veterinary Medical Association.

He was author of three books, and had written numerous articles for magazines and trade journals in the field.

Dean Giltner was also active in civic affairs of the Lansing community. He served for six years on the East Lansing Board of Education, including two-year terms as secretary and president; and for more than 20 years he has been a director of the East Lansing State Bank and the East Lansing Building and Loan Association.

He is survived by his wife, Mrs. Mabel A. Giltner; two sons, William and David, both of East Lansing; and two daughters, Mrs. Charles Parrish, Grand Rapids, and Mrs. Richard Teel, Chicago.

Funeral services were held July 17 in the Colonial Chapel of Estes-Leadley funeral home, Lansing, and burial in the Lansing Evergreen Cemetery.

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Former ASTP Students Should Volunteer for Active Service

The Army Veterinary Corps urgently needs veterinary reserve officers in the grades of captain and lieutenant for active duty for periods of one, two, or three years. Officers with previous service in the Veterinary Corps Reserve or AUS will be accepted for one year; those without prior service must agree to serve for a minimum of two years.

General McCallam, Chief, Army Veterinary Service, calls on those veterinarians who were in the ASTP during World War II and were deferred from active military service at that time in order to complete their education, and have not served in the Armed Forces since graduation, to volunteer immediately for active duty. He feels such individuals have a moral obligation to serve their country. They are needed now. For application blanks and other particulars telegraph or write Chief, Veterinary Division, Office of The Surgeon General, Department of the Army, Room 2055, Main Navy Building, Washington 25, D. C.

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Cattle On Feed

The number of cattle on feed July 1, 1950 in the three important feeding states, Illinois, Iowa and Nebraska, was 1,424,000 head, 42% larger than those on feed for the same period last year, according to BAE report released July 19. Marketing of fed cattle from these states during period from April 1 to July 1 was 19% less than during the same months last year.

Report of Expert Committee on Rabies, World Health Organization (WHO)*

The first session of the World Health Organization (WHO) Expert Committee on Rabies was held in Geneva, Switzerland, April 17-22, 1950.

In its observations and recommendations, the Committee summarized briefly most recent important advances in the study of rabies. Important vectors of rabies virus other than dogs, cats, wolves, jackals, and foxes, were recognized including the viverridae (mongoose, meercat, and genet cat) in the Union of South Africa, and vampire bats in the South and Central American states. The need for further ecological studies was suggested since the existence of asymptomatic carriers has arisen out of the observations made on vampire bat as vector of the disease.

For many years the possible prophylactic use of rabies immune serum has been recognized, and experiments have pointed to its practical potentialities. More recent experimental work employing quantitative procedures has definitely shown the superiority of hyperimmune serum, especially when combined with a course of vaccine, over the use of vaccine alone after exposure to peripherally introduced street virus. Practical means of producing this serum have been demonstrated. The use of highly potent hyperimmune serum preceding a course of vaccine gives promise of saving most of those cases of human rabies in which short incubation time does not allow a sufficiently long period for the development of active immunity. In view of experimental findings, the Committee believes that at the present time serum combined with vaccine offers the best promise as a means of preventing rabies after severe exposure, and recommended field trials in human beings thus exposed. Dr. M. Baltazard, Director, Pasteur Institute, Teheran, Iran, was designated responsible for carrying out these trials.

The frequency of rabid wolf bites in man is relatively high in Iran; 60 during the year 1949, and 22 for the first four months of 1950. These cases are always severe, occur in groups, and at least half of the number of persons in each group exhibit mutilating head and face wounds. Mortality rate exceeds 30% in persons bitten in spite of intensive vaccine treatment. The suggested plan of treatment will meet the severest kind of test under the circumstances existent in that part of the world.

Indications for Vaccine Treatment

The Committee considered the variations in indications for vaccine treatment at present used throughout the world. However, there was general agreement along the lines set forth, which have been formulated with a view towards reducing to a minimum the number of persons subjected to treatment unnecessarily.

Fairly often a situation arises in which a person previously exposed and treated with vaccine is again exposed to infection with rabies. The question as to whether treatment should again be instituted and, if so, on what basis, must be answered. It is recommended that if this situation arises within three months of the first or previous course of vaccine, no further treatment is necessary unless the second exposure is of a severe type. If the interval is between three and six months, two reinforcing doses of vaccine, one week apart, are indicated, whereas if more than a six months' interval has elapsed, the treatment should be on the same basis as if it were an original exposure.

Allergic manifestations such as angioneurotic edema, fever, adenopathy, shock, etc., that occasionally follow administration of rabies vaccine may be circumvented by a change to vaccine made from brain tissue of a different species of animal.

The Control of Rabies in Animals

The Committee recommends that where feasible a biting animal should be kept under observation for a period of ten days. If the animal shows no signs of illness during this period, it can safely be assumed that the animal was non-infective at the time of biting.

Where only restrictive measures are depended upon to control outbreaks of rabies, dogs should be confined for a minimum period of 90 days. If vaccination is done, the restraint period may be reduced to 30 days after vaccination. Destruction of exposed animals or isolation for six months, or if vaccinated within 12 months, revaccination and 30 days isolation is recommended. No specific recommendations were made with respect to the vaccination of meat and milk-producing livestock following exposure. In the case of extensive land areas, and where rabies is already present in domestic and wild animals, it is recognized that quarantine measures, however strict, are impracticable.

*Abstract of printed report. This may be obtained by writing the World Health Organization, Sales Section, Palais des Nations, Geneva, Switzerland.

A Permanent Veterinary Research Laboratory for Diseases of Dogs

A recent addition to the New York State Veterinary College at Cornell University, Ithaca, is the newly established Cornell Research Laboratory. All funds for its construction and initial operation have been presented to the University by donors who wished to found a permanent center where fundamental long-range research upon contagious diseases of dogs could be planned and conducted by skilled scientists. Among donors are veterinarians, dog owners, industrial companies, kennel and breed clubs. Construction has begun on the new laboratory, which will resemble and adjoin the new state-supported isolation building where important studies have been started recently on infectious diseases of poultry and farm animals. Results from this work correlated with similar studies on diseases of dogs, particularly those viruses infecting several species, should prove of great value. It is necessary, therefore, to work with many species of animals in order to study all factors that pertain to transmission of disease and effective methods of control.

Work will be under the direction of Dr. James Andrew Baker, professor of bacteriology of the veterinary college. Doctor Baker received his B.S. and M.S. degrees at Louisiana State University and his Ph.D. in 1938 and D.V.M. in 1940 at Cornell. At the Rockefeller Institute for Medical Research, he isolated viruses from calf pneumonia and from pneumonitis of cats, and in collaboration with Dr. Ralph B. Little, was the first worker to isolate living leptospira from cattle in the United States. From 1942 to 1946, he served in the Veterinary Corps of the Army of the United States as one of the original group of American and Canadian scientists selected for work at the international War Disease Control Station established at Grosse Isle, Canada. There he developed an original method of virus transfer which he later adapted to hog cholera virus and which is now being used on other viruses. In the winter of 1947 he returned to the veterinary staff of the New York school.

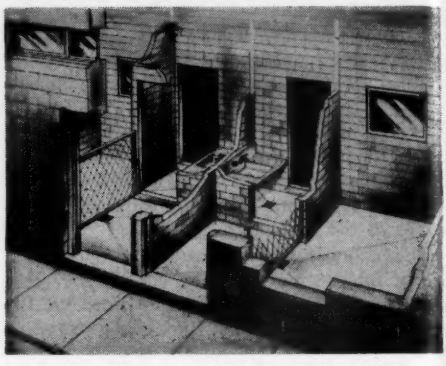

Fig. 2. Cut-away section showing typical kennel, dressing room and entry unit.

Dean W. A. Hagan believes that intensive, carefully planned work by a staff of specialists, using modern equipment in a building scientifically planned and constructed for this purpose, cannot fail to produce results important to the dog world and our animal population generally.

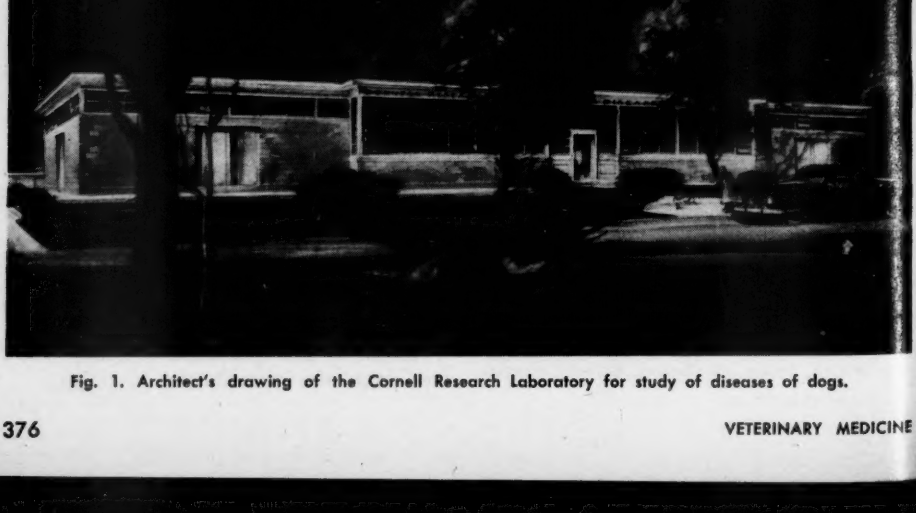

Fig. 1. Architect's drawing of the Cornell Research Laboratory for study of diseases of dogs.

Lobund Dedication at Notre Dame

A new tool for scientific research is the realization of efforts by scientists at Notre Dame in the provision of further facilities for maintaining experimental animals under germ-free conditions. New Lobund laboratories, an extensive development to accommodate approximately 1,000 small experimental animals and birds on the campus at South Bend, Ind., was dedicated this summer.

Considerable publicity was given in newspapers and magazines, in which was outlined some facts already revealed by observations on mice living in a sterile environment. Methods by which caretakers and others enter these germ-free tanks were illustrated. A plastic suit, including a helmet equipped with air lines has been designed much as a diver's suit. Preparation before entering the room includes complete submersion of the "diver" in antiseptic solutions. Sterile food is provided animals, and filtered, bacterial free air only enters the chamber.

This unique project developed by Dr. James A. Reyniers, director of Lobund, is expected to answer such questions as the effect of bacterial life on the development, digestion, disease processes, and senility in mammals. Data now accumulated suggests that microorganisms are responsible for dental caries, and shorten longevity. Test animals do not appear to develope senile symptoms as early as those cultured under ordinary laboratory colony methods.

The potential value of these studies is incalculable in assessing the value of devices and agents that will accomplish the favorable effects of a germ-free environment.

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Changes in Poultry and Turkey Improvement Plans

Revisions and changes in the National Poultry Improvement Plan, based on recommendations of delegates at the National Plans Conference, is announced by the USDA.

The pullorum disease phase of the plan is strengthened by additional check-testing requirements. Check-testing is a means of retesting by the state tester of a sample of birds from flocks that have been tested by an authorized agent.

The most important change in the turkey plan is the requirement for use of the standard tube test method for the U. S. Pullorum-Passed Class, limiting use of the rapid whole-blood test to the U. S. Pullorum-Controlled classification. This change to be effective July 1, 1951. Further, in regard to turkeys, custom hatching for non-participating flocks is prohibited.

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Cavalry Service Now Mechanized and Named Armor

The Army Organization Act of 1950, signed by the President on June 28, formally abolishes the cavalry, replacing it with a new branch designated Armor. Replacement of mounted with mechanized units actually took place years ago, at which time the first notes of taps sounded for these outfits. In June 1948, the military establishment gave up its last horses. All that remain of this colorful branch are the records of action in which these veteran units had a part and a few remaining soldiers whose basic training was mounted. The famous 1st Cavalry Division, now fighting in Korea, retains its original designation despite the formal dropping of the cavalry.

On the rolls of the famous and historic cavalry school, Fort Riley, Kan., are such illustrious names as Douglas MacArthur, Jonathan M. Wainwright, Ben Lear, George S. Patton, Lucian K. Truscott, and many others. Stables still stand at this Kansas post, as does the veterinary hospital. These now house tank units, personnel and modern machines of war.

An epoch in American military history has come to an end. As H. I. Phillips wrote:

> "Cut is the tie of man and horse
> Hell-bent to do or die
> No longer 'Boots and Saddles' sounds
> Across exciting fields . . .
> A scratching pen is requiem
> To which an epic yields."

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No Immediate Plan to Call Reserve Officers

Although the Department of the Army has stated that there are no immediate plans to call up members of the reserve, Congress has voted to continue the draft law. Members of the veterinary reserve component of the Army or Air Force may be called at any time, with or without their consent.

Under the law, the President or Congress has the power to order reserves to active duty.

It is suggested that veterinary reserve officers keep in contact with their local reserve units.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

In an admittedly preliminary report, Cunha of the Florida Agricultural Experiment Station, tells about the use of aureomycin in the feed of pigs. The basal ration fed consisted of corn, peanut meal, minerals and the known vitamins. To each 100 pounds of this ration there were added 9.1 gm. (about a teaspoonful) of aureomycin. At the end of a 54-day feeding period, the pigs receiving the aureomycin had gained weight at the rate of 1.69 pounds per day, while the control group, fed the same ration without aureomycin, had gained 0.75 pounds daily. In other words, the aureomycin-fed pigs required 289 pounds of feed for 100 pounds of gain, while the controls consumed 468 pounds of feed for each 100 pounds increase in weight. The aureomycin seemed to stimulate appetite as pigs receiving it consumed 4.88 pounds of feed daily, whereas the controls ate 3.51 pounds per day. Two hypotheses are advanced for these results; (1) that aureomycin destroyed harmful microorganisms in the pig, and (2) that it stimulated the growth of organisms in the intestinal tract necessary for synthesizing some factor needed for the pig's growth. The control group had some scours—the aureomycin-fed pigs were free from such symptoms.

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More and more reports are being received about cattle being affected with so-called circling disease. Veterinarians are familiar with the condition under the name of listerellosis due to *Listerella monocyogenes* infection. The condition is not uncommonly evidenced by ketones in the urine demonstrated by the Ross test, in addition to common nervous symptoms reported. In these cases, the ketosis is only a complication of listerellosis. Prevention and treatment are still unknown.

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Coarse obstetrical wire is the favorite instrument with many veterinarians for dehorning cattle. Cornual anesthesia is practiced. Included in the removed structures there is approximately ½ inch of the soft tissue surrounding the base of the horn. The wire may develop friction heat, but this helps to control hemorrhage.

Cole, of the University of California, states that if cows are pastured on Sudan grass overnight, bloat is prevented on alfalfa pasture the following day. This method of management appears just as effective as feeding Sudan grass hay. The action of Sudan grass in this connection is said to be due to its coarseness counteracting the fineness of green legumes.

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An accurate diagnostic test for cancer would be a most valuable aid to physicians and veterinarians, but up to the present time all research attempts to develop such a test have proved to be fruitless. At various times tests have been announced, rather widely exploited commercially, and demonstrated to be valueless later.

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Moule, of the Sheep and Wool Branch, Department of Agriculture and Stock, Queensland, Australia, states that northern Australian rams sent to southern Australia during the season when the days are becoming shorter (the days never become as short in the south as in the north of Australia), and then returned to the north during the breeding season, were entirely lacking in libido. However, rams subjected experimentally to "dark room treatment" when the days were increasing in length showed considerable libido or sex desire and worked well. It is postulated that longer days may depress the activity of the pituitary gland with subsequent decrease in the activity of the interstitial cells and suppression of desire.

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Announcement of the first large scale commercial production of allethrin, a synthetic compound having insecticide properties similar to pyrethrum, came from Union Carbide and Carbon Corporation.

Tests on common houseflies have shown that this new chemical is equally as effective as pyrethrins in knockdown and kill action, in addition to advantages of freedom from natural resins contained in the product extracted from the African-grown flower.

POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

Another good review of the literature on Newcastle disease has been published. It is Epidemiology of Newcastle Disease, by Dr. B. D. Blood, Chief, Veterinary Public Health Section, Pan-American Sanitary Board, (Bulletin, Pan-Am. Sanit. Bur., 29:28, 1950). Included in the report is a discussion of the human Newcastle virus infections with a tabulation of the reported cases in man. Listed are nine reports involving 59 persons, but in only three of the nine reports involving five persons was the diagnosis confirmed by the isolation of the virus. In all of these, conjunctivitis was the primary symptom. The other cases were diagnosed by epidemiological and/or serological studies. Another portion of the review is devoted to the relation of the virus to the viral agents of several human infections, including influenza, mumps, poliomyelitis, lymphocytic choriomeningitis and infectious mononucleosis. One is impressed, after reading the review, of the need for a great deal of fundamental research on Newcastle disease virus in relation to these other viral agents.

A comprehensive list of 78 references is reviewed by the author.

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Have you read Dr. F. C. Tucker's article, Twenty-five Years of Poultry Practice? (*Jour. Am. Vet. Med. Assn.*, 116:99 [Feb.], 1950.) Doctor Tucker is one of our best boosters for inclusion of poultry in the list of animals to be treated by the practicing veterinarian. His 25 years as a successful poultry practitioner are an example of what can be accomplished in this field of veterinary medicine, if one is interested.

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Wet litter in poultry houses usually can be traced to one or more of the following errors in management; faulty drinking fountains, over-crowding, irregular feeding time, improper ventilation, inadequate insulation, poor litter management (Dossin, C. O., *Poul. Tri.*, 55:7 [Sept.], 1949).

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Georgia produces over 30,000,000 broilers per year. The rapid growth of the broiler industry in this state is indicated by the fact that 15 years ago, only an average of 400,000 broilers were produced annually.

A new type of vaccine for use against Newcastle disease has appeared on the market. It is commonly known as the Hitchner-type, or as the intranasal type of vaccine. It is a live virus vaccine produced with an attenuated strain of the virus, which, when introduced into the nostril of birds in minute quantities, produces a mild respiratory infection with subsequent immunity of at least a few weeks. Its chief value appears to be for protection of broiler flocks, and for use in laying flocks which have not previously been vaccinated and have become exposed to the disease. Under normal conditions, where live-virus vaccines are to be used, the usual stick method of vaccination is recommended by most authorities. The intranasal technic consists in inserting a small drop of vaccine into each nostril with the aid of a special dropper pipet.

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"Hormonized chickens bring good premiums", is the title of a lecture delivered at the annual fact-finding conference of the Institute of Poultry Industries (*U. S. Egg Poul. Mag.*, May 1950). This article should be of interest to veterinarians who are in a position to add to their income by the sale of and injection of the various products now available for producing hormonized chickens. According to the author, it costs about one additional cent per pound to produce such birds, and the usual premium is about five cents per pound.

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A total of 47 states are now cooperating in the administration of the National Poultry Improvement Plan. The egg capacity of the cooperating hatcheries in the Plan is equal to 63% of the total egg capacity for all hatcheries in the United States. These hatcheries had an egg capacity of nearly 350 million in 1949, and controlled over 27 million birds in hatching supply flocks.—BAI Report for 1949.

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Sterilamps (ultraviolet rays) are of little or no value in controlling air-borne outbreaks of infectious disease under normal poultry farm conditions.

VETERINARY PARASITOLOGY

A. O. FOSTER, B.A., M.A., Sc.D.
Beltsville, Maryland

Rotenone Spray Formulations for Cattle Grubs

Derris and cube, in spite of all competition, have remained the only efficacious agents against Hypoderma. Moreover, except for spreaders devised during wartime curtailments of rotenone-containing substances, the standard rotenone wash has been the most widely used prophylactic medication for the destruction of grubs in the backs of cattle. Following trials with seven recognized insecticides,[1] which led to the usual conclusion already indicated, entomologists in California made comparative trials of pressure sprays with nine rotenone formulations[2]. The experiments are noteworthy not only because spraying has become a preferred method of application in many areas, but also because, in addition to other interesting indications, some light is thrown on the effect of incorporating wetting agents, sulfur, and synergists into the formulation. A rather complicated but interesting analysis of the results suggested the following interpretations: (1) Derris of 5% rotenone content when used at the rate of 5 lb. to 100 gal. of water, as sometimes recommended, was only about half as effective as a ten-pound dosage; (2) the addition of a wetting agent increased the efficacy of the formulations; (3) the addition of certain synergists did not enhance their efficiency; (4) the presence of sulfur did not influence their efficacy; and (5) *Hypoderma bovis*, as previously thought, was more resistant to insecticidal action than *H. lineatum*.

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Ocular thelaziasis is reported[3] to affect large numbers of cattle in Roumania, the infection rate in some localities being as high as 60%. Presumably, the parasite is arthropod-borne, but nothing specific is known about its transmission, susceptibility to drugs, or control.

[1]Furman, D. P., and Douglas, J. R., Comparative Evaluations of Insecticides for Cattle Grub Control. *Jour. Econ. Ent.*, 41:783, 1948.

[2]Douglas, J. R., and Furman, D. P., Comparative Evaluation of Rotenone Formulations for Cattle Grub Control. *Ibid.*, 42:884, 1949.

[3]Popa, M., *Clin. Vet.*, Milano 70:98-103 (July-Aug.) 1947, (*Vet. Bul.*, Feb., 1949).

The Pathogenicity of Ruminant Tapeworms

Two recent papers,[4,5] deal with a question that has been discussed in veterinary and parasitological literature for three-quarters of a century, perhaps longer. One is an experimental study of the effects of *Moniezia expansa* in lambs. Retardation of growth, with some depression of the hemoglobin and hematocrit levels, was attributed to the presence of tapeworms. There was no diarrhea, although a lamb that received 60 cysticercoids passed soft pellets six weeks afterwards. The other report describes an outbreak of monieziasis in calves in Illinois. The flock was first observed in 1948, when 19 of a herd of 79 calves had already died and 42 were sick, but the owner reported that the disease first occurred in 1945. Symptoms, in addition to frequent stuntings and many deaths, were weakness, roughened coats, anemia, ascites, diarrhea, and secondary pneumonia. Mortality was as high as 50%.

Both studies are informative, yet neither will materially influence the opinions of those who are closest to the subject. The first study was based upon only two infected lambs and one control. The differences observed, however significant, could have been due to individual variation or to factors, such as nematode infection, of which no mention was made. In the second study, the role of tapeworms was presumptive and nothing was said of the presence of other gastrointestinal parasites or of the possible importance of other disease factors.

From these and other studies, it is altogether evident that the mere presence of tapeworms and the favorable effect of instituting measures against them are insufficient proof of the injuriousness of the species. It is also probable that experimental failures to demonstrate pathogenicity will remain somewhat unconvincing. It is significant that, despite the voluminous literature, there appears to have been no instance where a thorough study, even of parasites, has been made in an outbreak of disease associated with monieziasis.

[4]Hansen, M. F., Kelley, G. W., and Todd, A. C., Observations on the Effects of a Pure Infection of *Moniezia expansa* on Lambs. *Trans. Am. Mic. Soc.*, 69:148 (Apr.), 1950.

[5]Link, R. P., Levine, N. D., Danks, A. G., and Woelffer, E. A., Moniezia Infection in a Calf Herd. *Jour. Am. Vet. Med. Assn.*, 117:52 (July), 1950.

Repellents Against Dog Ticks

In tests at the New Jersey Agricultural Experiment Station, the impregnation of coveralls or trouser legs with dibutyl adipate or n-hexyl mandelate, 2 gm. per sq. ft., gave a high degree of protection against the American dog tick, *Dermacentor variabilis*, during test exposures of two to four hours.[10]

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Fewer Treatments Against Hornflies

The addition of fused bentonite sulfur, 0.12%, to methoxychlor, lindane, DDT, and pyreenone preparations has been reported[11] to prolong the period of protection against hornflies in beef cattle.

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A recent report[9] on the chemotherapy of canine heartworm infection regards fuadin as the treatment of choice, and stresses the efficacy, safety, and convenience of administering the drug intraperitoneally instead of intravenously or intramuscularly. With standard dosages, from six to 25 injections were employed in seven clinical cases, with resultant disappearance of microfilaria from the blood stream and marked improvement in general condition of the dogs.

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Practitioners should guard against the use of excessive concentrations of benzene hexachloride in the treatment of demodectic and other forms of mange in dogs. Because of the risk of serious intoxication, the gamma isomer content of any preparation applied to a large area of the body probably should not exceed 0.15% in any instance and, preferably, should be from 0.05 to 0.10%, whether prepared from the crude chemical containing a mixture of isomers or from the commercially pure lindane. Notwithstanding reports of the successful use of higher concentrations, the record of experience clearly indicates the advisability of exercising the utmost caution.

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Caricide, an antifilarial drug that has shown effective action against ascarids in cats and dogs, has been found to be unsuitable for the treatment of ascariasis in chickens.

[10]Granett, P., and French, C. F., *Jour. Econ. Ent.*, 43:41 (Feb.), 1950.

[11]Cuff, Ray L., *Jour. Econ. Ent.*, 43:111-112 (Feb.), 1950.

[9]Mark, I. C. *N. Am. Vet.*, 30:588-590 (Sept.), 1949.

Myiasis of Foxes and Mink

The maggots of two sarcophagid flies, *Wohlfahrtia vigil* and *W. opaca*, cause heavy losses among fur-bearing animals, and with recent expansion in the fox and mink industries cutaneous myiasis has become a very acute problem. Individual mink farmers have reported losses of 30% of their kits in one season, and have estimated that such losses amount to as much as $4,000. in some cases. A report from the Colorado Agricultural Experiment Station[12] recommends thorough examination of all young animals on a fur ranch during each fly season and the removal of larvae with forceps. Removal is facilitated by the application of a few drops of chloroform or ether to the openings of the cysts. In limited trials, dusting the young animals with 3% to 10% DDT powder, rubbing the material into the fur, gave good results in the prevention of myiasis.

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A basal cereal ration supplemented with 14.2% soybean oil meal, with skim milk given in lieu of water every second day, has been reported to produce higher resistance in chickens to the common roundworm, *Ascaridia galli*, than the same ration without milk or the basal ration with 14.2% meat scrap in place of the soybean oil meal[6].

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A technic for treating bovine venereal trichomoniasis, described by Dr. Emil Hess of Zurich,[7,8] is based upon the fact that *Trichomonas foetus* is essentially anaerobic and thus especially susceptible to inhibition of growth and destruction by the presence of free oxygen in its environment. Bulls are treated by injecting into the prepuce about ten liters of freshly prepared 3% hydrogen peroxide solution. It is warmed and applied with a special spray apparatus under pressure of 140 to 150 pounds per square inch. Cures are said to be effected with one or two treatments.

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The vaginal administration of 0.25 to 0.5 lb. of penicillin ointment via long pipette is effective treatment for nonspecific bovine vaginitis.—*G. T. Easley, D.V.M.*

[12]Gassner, F. X., and James, M. T., The Biology and Control of the Fox Maggot, *Wohlfahrtia opaca* (Coq.). *Jour. Parasit.*, 34:44 (Feb.), 1948.

[6]Riedel, B. B., and Ackert, J. E., *Poul. Sci.*, 29:437 (May), 1950.

[7]Treatment of Bovine Trichomoniasis. Proc. 53rd Ann. Mtg. U. S. Livestock Sanitary Assn., 120-127, 1949. (Orig. Publ. in *Schweizer Archiv f. Tierheilkunde*, 91:481, 1949.)

[8]*Ibid. Jour. Am. Vet. Med. Assn.*, 116:291, 1950.

ABSTRACTS OF LITERATURE

Treatment of Eczema in Dogs

The percentage of eczema cases is far higher among dogs than other domesticated animals. When diagnosing dermatosis, a microscopic check of a number of skin samples should be made since parasitic conditions often show symptoms very similar to those of nonparasitic eczema[35].

Eczemas are caused by exogenous factors (mechanical ones, parasites, dirt, etc.), endogenous factors (dietary deficiencies, nephritis, dyshormonism, allergies), and predisposition of the skin (constitutional and hereditary factors, chronic endogenous-toxic stimulation, etc.).

Therapy should be directed toward: (1) exclusion of the exogenous and endogenous factors; (2) increase of the natural resistance of the skin (non-specific stimulants; feed supplements); and (3) local treatment based on the use of certain proprietary remedies, such as fissan, a combination of basic silicum fluoride (hygroscopic), diatoms (absorbing) and a milk albumin-fat emulsion (local protein stimulation); sulfonamides; preparations containing tar, Peru balsam, sulfur, salicylic acid; *x*-rays; and ultra-sound waves.—*G.L.*

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Amino Acids in High Protein Corn

Improvement in the nutritive value of plant foods for both human and animal consumption has led to the development and use of varieties of plants having superior nutritive value with respect to certain nutrients or class of nutrients.

Data accumulated by Miller, *et al.*,[42] show that distribution of the group of amino acids in corn studied was consistent as to proportions and varied directly with the crude protein content. Increase in protein content, therefore, does not improve the amino acid pattern.

Since the value of a high protein crop is evident and requires a smaller quantity of expensive protein supplement, especially when fed to swine, large yields of high protein corn are a challenge. These objectives are possible if consideration is given to the maintenance or improvement of soil fertility and density of stand, as well as to hereditary factors in the grain.

[35]Mehls, H. J., The Eczema of the Dog. *Tierärztl. Umschau.*, 5:152, 1950.

[42]Miller, R. C., Aurand, L. W., and Flack, W. R., Amino Acids in High and Low Protein Corn. *Sci.*, 112:57 (July 14), 1950.

Methylene-Blue Test for Sperms

Live sperms have the ability to discolor methylene blue solutions. The rate of discoloration depends on the temperature of the dye solution used and, as Dr. M. Brochardt[36] described, on the concentration of living sperm. Thus, by using an aqueous methylene blue solution (concentration not stated) in a capillar tube, the percentage of live and of dead sperm can be dependably determined. Tests with 33 semen samples from four bulls proved that the new discoloration method can be used in place of the microscopic investigation of semen.—*G.L.*

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Animal Parasites Transmitted to Man

In a brief report on parasites of animals that have been definitely reported in man, Koutz[39] lists nine species of Arachnida, 13 Insecta, ten Cestoda, 15 Nematoda, three Trematoda, two Protozoa, one Acanthocephala, and three fungi, for a total of 56 different species. The author points out that this tabulation has been taken from world literature and in some instances from a single incident of infection that is of doubtful occurrence or of questionable identification.

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Survival of Coccidial Oocysts

In carefully controlled experiments at the Animal Disease Research Laboratories, Ohio Agricultural Experiment Station,[40] oocysts of avian coccidia, *Eimeria tenella,* survived winter exposure and were found infective after 272 days, both by feeding the contaminated soil and by natural exposure trials.

Other species of coccidia infecting chickens survived in great number for longer periods when protected from the sun by growth of grass or weeds.

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Administration of tablets containing iron to baby pigs is preferred over older recommendations to smear preparations of antianemic drugs on the sow's udder.—*J. D. Ray, D.V.M.*

[36]Brochardt, M., Investigation of Bull Sperm Through the Methylene-blue Test by Means of Capillar-tube Technic. *Die Veterinärmed.*, 1:46, 1948; *Rec. Vet. Med.*, 124:64, 1948.

[39]Koutz, F. R., Animal Parasites Reported from Man. *Speculum*, 3:3 (Winter), 1950.

[40]Koutz, F. R., The Survival of Oocysts of Avian Coccidia in the Soil. *Speculum*, 3:3 (Spring), 1950.

Heat Exhaustion in Mink[41]

Heat exhaustion is explained by the author as a paralysis of the heat-regulating mechanism caused by prolonged exposure to excessive heat, either from the sun, or from confinement in a close, hot place. Greatest losses in mink occur at whelping time when young kittens are housed in humid, improperly ventilated pens. Danger of losses from heat exhaustion are reduced when pens are constructed to provide comfort during the summer season. Provision for shade, sprinkler systems, and other management methods help to prevent losses during periods of excessive heat.

Young mink kit showing symptoms of heat exhaustion. It is unable to move rapidly, and when disturbed will turn on its side and cry weakly.

Young kits die in nests without showing visual symptoms. Nursing females in distress during suddenly occurring heat waves fail to nurse kits properly or may lie in the doorway of the nest box shutting off any cooling air currents. Older kits become quiet and stretch out on their sides (see illustration). When disturbed, affected individuals display nervous symptoms and convulsions. Deaths occur rapidly.

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There is considerable evidence to show that sows may carry a residual streptococcus infection between litters of pigs.—*J. D. Ray, D.V.M.*

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A combination of iron-treated cottonseed meal and meat scraps was superior to either alone as a protein concentrate for pigs in dry lot.—*Ann. Rpt. Ohio Sta. Bul.* 695.

[41]Gorham, John R. *Am. Fur Breeder*, 22:26 (Apr.), 1950.

Sensitivity of Skin Regions of Cattle

During an experiment designed to study sensitivity response to tuberculin and Johnin in various skin regions of cattle,[44] Larsen, *et al.*, found that injection of these diagnostic agents into the skin of the neck region of a small group of previously sensitized animals, gave reactions that indicate significant differences between sensitivity of different regions of the body. In comparing reactions in the neck with those of the caudal fold, neck region injections were distinctively more perceptive.

In herds where tuberculosis has been difficult to eradicate, utilization of injection sites for tuberculin that are most sensitive may assist in the problem of eliminating spreaders.

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New Staining Method for Brucella Ring Test Antigen

The milk ring test for detecting Brucella agglutinins in milk, first described by Fleischhauer in 1937, has come into widespread use (*Vet. Med.*, 44:240 [June], 1949). Present methods limiting its usefulness apply to procedures of staining the antigen. These frequently interfere with sensitivity, specificity, color intensity and keeping qualities.

A tetrazolium salt compound, 4,4′-bis(3,5-diphenyl-2-tetrazolinium)-biphenyl dichloride,[45] has been found to be superior to other stain for Brucella antigen. This compound is reduced by living cells to an intensely colored violet-blue formazan. It appears that this reduction takes place inside the cell, and hence the antigenic specificity of the cell surface is unaltered. This antigen has remained stable over prolonged periods under normal conditions of use and storage.

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The host of animal disease problems throughout the world requires that the veterinary profession of the state and nation be perpetually alert to establish and maintain proper precautions against their introduction and spread. —*James Steele, D.V.M., M.P.H.*

[44]Larsen, Aubrey B., Groth, A. H., Johnson, Howard W., Allergic Response to Johnin and Tuberculin of Various Skin Regions of Cattle. *Am. Jour. Vet. Res.*, 11:301 (July), 1950.

[45]Wood, Ronald M., Brucella Ring Test Antigen Prepared by Reduction of a Tetrazolium Salt. *Sci.*, 112:86 (July 21), 1950.

CLINICAL REPORTS

The Effect of Fuadin on the Semen of Dogs

R. L. BISHOP, D.V.M., Crookston, Minn.

In order to throw some light on the question of whether or not any of the trivalent antimony compounds used for the treatment of *Dirofilaria immitis* would cause sterility in stud dogs, a mixed shepherd male, 18 months of age and* weighing 45 pounds, was given a daily injection of fuadin for the duration of this experiment.

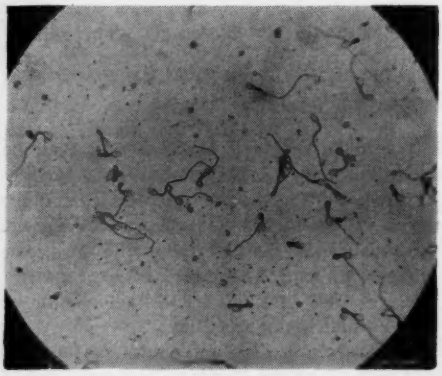

Fig. 1. Microphotograph of dog semen specimen collected after two weeks of heartworm treatment.

Microscopic examination of semen sample prior to drug administration indicated normal morphology and motility expected of such sample collected from a vigorous young male.

An intravenous dose of 2.5 cc. fuadin was given daily beginning on February 25, 1950 and continuing through March 4. Alteration in motility of semen was noted in a sample collected on February 27, three days after treatment was begun. After five days of treatment, motility of the spermatozoa was reduced to approximately 10% of that noted in the sample collected prior to treatment. No change was observed in morphology at this time. Nine days of treatment so affected sperm structure that in specimens collected at this time 55% were abnormal; either headless or having curled tails.

Motility of sperm in a sample collected after two weeks of daily treatment was reduced to between 5% and 10% of normal; only sporadic movement noted. Abnormal structure was noted in 80%. This degree of degeneration of spermatozoa was not further reduced though an additional four days of daily treatment was given.

One week after treatment was discontinued, sperm morphology had returned to 80% normal and motility had increased to approximately 75% of that noted in original sample collected prior to treatment. Two weeks after discontinuance of treatment, semen sample appeared normal in all respects.

During the entire course of the experimental work, the animal's personality, playful vigor and general health remained unchanged.

It is concluded that treatment for heartworm infection has only a temporary and fleeting effect on spermatogenesis in male dogs. Return to normal is rapid and complete. Sterility noted in infected cases undergoing treatment is thus explained.

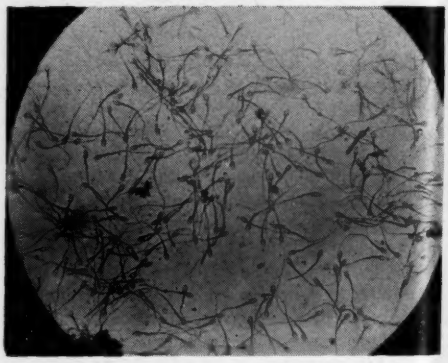

Fig. 2. Return to normal is evidenced by microphotograph of specimen collected two weeks following discontinuation of treatment.

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In trials conducted by physicians of the Student Health Service, University of Minnesota, on the value of antihistamines and ascorbic acid for early treatment of the common cold, it was concluded that these agents alone or in combination had no important effect on the duration or severity of these infections of the upper respiratory tract. — *Jour. Am. Med. Assn.*, June 3, 1950.

*This work was done while Doctor Bishop was a senior student in Veterinary Medicine, under the direction of Dr. E. J. Frick, School of Veterinary Medicine, Kansas State College, Manhattan.

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VETERINARY ITEMS OF INTEREST

New chemical conquests of disease are adding to the realization of the dreams of early scientists.

▼

Pica is an early and primary symptom of phosphorus or calcium deficiency, particularly evident in phosphorus deficiency.

▼

Chicks and pigs can be raised successfully on farm grown, all-vegetable rations if the diet is supplemented with vitamin B_{12}.

▼

Acute and severe types of swine enteritis seen under farm conditions may be due to a combination of infection and B vitamin deficiency.

▼

Synthesis of adenocorticotrophic hormone (ACTH), now obtained from the pituitary gland of hogs, is projected and possible of early realization, according to Doctor Li, who first isolated this fraction.

▼

Thirty communities have now passed ordinances to save unwanted, unclaimed pound dogs from destruction so that these animals might be used for medical studies in schools and research institutions.

▼

An experiment, using DDT, to make Cuba's Isle of Pines a mosquito-less resort is under way; this infested island where malaria is rampant was the inspiration for Stevenson's Treasure Island.

▼

When calves were fed milk in which the riboflavin was destroyed by ultraviolet light, they began to show deficiency symptoms characterized by erratic growth, intermittent diarrhea, dry skin, loss of hair, excessive salivation and flow of tears, in from two to four weeks. —*Bul. 695, Ohio Agr. Exp. Sta., Wooster.*

▼

The addition of mineral supplements to livestock rations when they are not needed is not only an unsound economic practice, but may be actually injurious to animal health. Mineral elements are in delicate balance in the animal's body which is dependent on many factors. Imbalance by oversupply under certain conditions of vitamin and protein intake may result in symptoms of malnutrition and losses in condition and health as severe as those observed in mineral deficient animals.

A finding of science once recorded in a published report is safe against oblivion.

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Swine are affected with all three types of the Brucella organism.

▼

Exercise is the most important factor in maintaining normal spermatogenesis in bulls.

▼

India has only about ten veterinarians for each million head of livestock.

▼

Alfalfa hay proved more palatable to ten Holstein heifers in Ohio trials than clover or timothy.

▼

The virulence of the virus of swine influenza has increased during recent years. Losses as high as 50% of the pig crop are reported.

▼

It has been estimated that the total weight of *Ascaris lumbricoides* present in man in China is equivalent to the weight of 442,000 men.

▼

Erysipelas arthritis does not respond to antiserum treatment. Its use will prevent the occurrence of new cases in a herd.

▼

In studies at Illinois, maximum breeding efficiency in dairy cattle resulted when cows were first bred 100 to 120 days after calving.

▼

Low conception rate following artificial insemination is due primarily to faulty dilution procedures and other methods of handling semen.

▼

Traveling creameries are in use in Ireland; they are mounted on trucks which visit outlying farms, run the milk through separators, and buy the cream.—*S.N.L.*

▼

Continuing trials by the USDA and industrial concerns interested are expected to prove the usefulness of allethrin as the active ingredient of livestock fly sprays. From reports of experimental trials with this and the product scabrin (see *Veterinary Medicine*, 45:285 [July], 1950) and other new insecticides, it appears possible that these chemicals will make unnecessary future dependence on overseas sources of natural pyrethrins.

Thymus Gland—Persistent Or Overactive

FRANK R. BOOTH, D.V.M., Elkhart, Indiana

Many spontaneous losses in puppies of the larger breeds of dogs, as well as losses following surgery in young of all breeds, may be due to subclinical toxicosis related to persistence and overactivity of the thymus gland.

Thymus hypertrophy cannot always be demonstrated roentgenographically; neither does such universally portend that a pathological condition exists. Anomalies about the larynx and epiglottis, or birth injuries may yield identical signs and radiographs to those of an enlarged thymus gland. This theory, according to Kaplan, and based on observations made in children, is directly applicable to dogs.

Treatment found specific is x-radiation (100 r) according to the following technic: kilovolts 140; filter 3 mm. of Al, or ¼ mm. of Cu plus 1 mm. of Al at focal skin distance (FSD) of 25 cm. If indicated, dosage may be repeated at 48 hour intervals until a total of three treatments have been given.—Myron Thom, D.V.M.

THERE are few more controversial subjects in medicine than certain phases of the anatomy, physiology, and symptomatology of the thymus gland. Veterinary literature is practically devoid of any mention of this gland or its action. It has been necessary to refer to the scanty information offered in human medicine in order to attempt clarification of a subject which experience in veterinary practice has shown deserves more consideration.

Anomalies of the thymus gland are responsible for disease symptoms, according to authorities prominent in human medicine. Equally prominent authors consider the gland as relatively unimportant to good health.

Histology and Physiology

The thymus gland is essentially lymphoid tissue, surrounding the corpuscles of Hassall. These corpuscles are nests of epithelial cells cut off from the epithelium of the pharynx in the process of development. The body of the gland occupies the lower anterior portion of the neck, and extends down behind the upper part of the sternum.

The latest information available as to the final disposition of the gland, and as to how it may be a factor in the development and well being of the individual, is still controversial among physiologists and anatomists. There is even argument as to whether it is a ductless gland, or a part of the general lymphatic system. The original belief was that the gland became inactive shortly following birth, possibly in the first few weeks, and with age was completely replaced by connective and adipose tissue. Later information more or less disproves this assumption as thymus tissue has been found to be present throughout life.

Occurrence in Dogs

In puppies, we have learned that the gland decreases in size from the time of birth until approximately six months of age, followed by what appears to be a normal growth throughout life, except that it does not grow in direct proportion to the growth of the rest of the body, but at a slightly slower rate. Commonly the gland shows active principles at least until sexual maturity, and may, in fact, have some bearing on this phenomenon.

Interest in the subject of overactive or persistent thymus in the dog, and especially its relation to the health of puppies, has been of special interest to the author for the past 15 years. At the beginning of that period the first cases were diagnosed, and successfully treated. Since that time much information has been accumulated, indicating the existence of a pathological entity much more common than would be supposed, which is undoubtedly causing the death of many valuable puppies. Many could be saved by proper diagnosis and treatment.

Symptoms

The condition of glandular overactivity may occur at any time from birth until six months of age, irrespective of sex. There may be some reason to expect it to be more prevalent in certain breeds of dogs. Case records show it to have occurred in the following breeds: Bostons, Boxers, Pekinese, Great Danes, English Bulldogs and Cocker Spaniels, most commonly in the order given.

The prominent symptoms of the persistence of the gland are difficult breathing, cyanosis, tetanic-like spasms, and pain; all of which may originate rather suddenly, causing death within a short time unless heroic resuscitation methods are employed. It is not uncommon to find upon *x*-ray examination that the thymus gland is as large or larger than the heart, and this may to a certain extent account for the difficult breathing. In a few cases, this enlargement has been noted at the base of the throat, protruding above the sternum. By the application of slight pressure, the gland may be depressed into the thoracic cavity, thus giving some apparent relief from the dyspnea. This lasts only as long as pressure is applied.

It might be possible to conclude from this fact, together with the observation of frequent occurrence in the "bull-type" breeds, that the entire difficulty results from the actual enlargement and its pressure on the organs of respiration. However, experience has shown this not to be the case, as in many instances the enlargement could not in any way be construed to explain the symptoms. In these, size is not sufficient to cause abnormal pressure.

From the writer's experience, the more logical assumption is that the gland is functioning in an abnormal capacity, producing toxic substances which may interfere with the oxidation of the blood, or a toxin affecting the entire process of metabolism. It is believed this is true, because all cases do not exhibit hypertrophy, and while treatment gives complete relief, the gland is not immediately reduced in size as a result of the treatment.

Further symptoms may include a decided elevation of temperature, which undoubtedly adds to the possibility of a mistaken diagnosis. A temperature of 104 to 105 F. is not uncommon, and would seem to indicate the presence of some virulent infectious agent. The fallacy of this thinking is quickly proved by the return to normal temperature within a very few hours, without the use of any medication or treatment other than *x*-ray therapy. We can only assume that this temperature rise is a result of the normal metabolic processes attempting to combat developing toxemia.

Treatment

The method of treatment is entirely adapted from the human field, as *x*-ray is recognized as the only therapy in the human patient, where it has proved to be effective and lasting.

Diagnosis is not necessarily easy, and admittedly on many occasions diagnosis is made first by suspicion, proof being provided later by the results of treatment.

While spectacular in the acute form, with an accompanying high mortality, thymus toxicosis may also take more or less of a chronic form. If not eventually resulting in death, this at least retards normal growth and health of the individual. Numerous individuals have been observed in which appear the typical picture of a puppy which fails to do well, maybe stunted, and even though provided with an adequate diet, presents the appearance of nutritional deficiency. It is not uncommon to find these cases at six to eight weeks of age, with a normal growth of head, but a very much stunted body. The response to treatment of these is miraculous. Normal growth and development will be noticed within a matter of days. Within a period of four to six weeks, all evidence of malformation has disappeared.

It has been common knowledge among practitioners for many years that Great Danes frequently suffer from what has been supposed to be hereditary heart weakness or cardiac insufficiency. Probably the hereditary angle has been mere supposition, as some veterinarians account for the condition as resulting from too rapid growth. There is now evidence to indicate, and incriminate, thymus hyperactivity.

Postmortem findings in the dog parallel those found in man. Enlargement of the thymus gland may or may not be present, but there is usually glandular hyperemia, which is noted in all the lymphatic tissue. Kidneys commonly show congestion, with pronounced engorgement of the peripheral blood vessels. Condition of the heart is most indicative, as the muscle tone is weak, and the size of the organ is smaller than would be expected. It is not uncommon for the heart to be diminished in volume, and of insufficient tone to retain its normal shape when removed from the body.

The only satisfactory treatment is the use of *x*-ray as employed for therapy. One exposure, in either acute or chronic cases will effect results within a matter of hours. Many acute cases will evidence relief from distressing symptoms within a few minutes. One exposure may appear to be sufficient, but for lasting effect, it is best to give three treatments, two or three days apart.

Radiation by the type of machines commonly used in veterinary hospitals for making radiographs is of little value, except possibly for strictly emergency cases. It is best that

(*Continued on page* 406)

Vibrionic Abortion In Cattle†

R. D. BARNER*, D.V.M., M.S., and F. H. OBERST**, D.V.M.

VIBRIO FETUS infection in cattle is assuming more importance in the field of veterinary medicine. Low conception rates, abortions, and retained placentas continue to be encountered despite the fact that the number of brucellosis-free herds is increasing, and it is believed that in some instances *V. fetus* (bovine) may be the etiological agent responsible. The existence of this disease has been reported from various states and it is now recognized as being quite general in distribution. Its occurrence in dairy cattle in Kansas has been observed in negative cattle in a brucella-infected herd and in a brucella-free herd. Both herds were completely isolated from sheep, which gives support to McEwen's[1] conclusion that sheep are not an important source of infection for cattle.

History

In 1909, M'Fadyean and Stockman[2] reported the isolation of a Vibrio from aborting ewes and the successful experimental infection of pregnant ewes. Four years later, the same authors[3] reported the observation that natural outbreaks of vibrionic abortion had been seen in cattle and that cows had been successfully infected. Theobald Smith,[4] in 1918, identified the organism as a cause of abortion in cattle in the United States, and the following year, Carpenter[5] reported the occurrence of Vibrio in sheep.

Etiology

The organism *V. fetus* has been described as a Vibrio and as a Spirillum. It is a motile, curved, non-spore-forming, gram-negative rod or filament measuring approximately 0.2 to 0.5 by 1.5 to 5.0 microns[6]. It may be isolated from the fetus, fetal membranes, or uterine discharge. Being a delicate organism, its growth in primary culture may be so meager that it is easily overlooked on tryptose medium used in the isolation of Brucella. Morphologically, the organisms (see fig. 1) which the authors isolated from the stomach contents and liver of three fetuses were similar to *V. fetus*.

Huddleson[7] has reported a more suitable medium (thiol) for isolation, cultivation, and maintenance. He has found that the organisms will remain viable in thiol medium without transfer for at least 150 days at 26 C.

Pathogenesis

The principal symptom is abortion which apparently may occur at any time during the gestation period, and it is not unlikely that weak calves may die within a few days after birth. Plastridge and Williams,[8] however, place the mean age of the aborted Vibrio-infected fetuses at five months and those infected with *Brucella abortus* at seven months. They also state that the presence of *V. fetus* infection in brucellosis-free herds may cause an annual abortion rate of from 4% to 20%. Experimental work in the transmission of the disease in cattle has not been very successful, although Smith and Taylor[9] infected two of four pregnant cows by intravenous injection of the causative agent. The period of incubation in natural occurring cases of the disease has not been determined.

While the pathogenesis of vibrionic abortion is unknown, it is believed that organisms localize in the capillaries in the area of contact of maternal and fetal placenta, thus interfering with the placental circulation.

Herd Histories

In herd A, in which there were a number of brucella-infected animals, *V. fetus* was isolated from two aborted fetuses. Both cows had been officially calfhood-vaccinated with strain 19 vaccine and were negative to brucellosis agglutination tests at the time of abortion. Abortions occurred at five and 5½ months of pregnancy in these two animals. Following a three month sexual rest, both cows were rebred and have since delivered normal healthy calves, and are at present brucella-negative, although brucella infection is still present in the herd.

In herd B, a brucella-free herd, a number of abortions had occurred before a fetus was submitted for diagnosis. From this six-month

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aborted fetus, *V. fetus* was isolated. The cow has since delivered a normal live calf, and no further abortions have occurred in the herd up to the present time.

Pathology

In three aborted fetuses observed by the authors, the presence of a sanguineous or serous fluid containing fibrinous flocculi was noted in the thoracic and abdominal cavities. Other findings were edema of the subcutaneous tissues and yellowish, flocculent debris in the true stomach. While focal areas of necrosis in the liver, resembling those of blackhead in turkeys, have been noted in *V. fetus* infection in sheep, such lesions have not been observed in cattle. The fetal membranes were thickened, necrotic, and comparable to some of those observed following abortion caused by Brucella. Through extensive studies of Vibrio infected fetuses, a micropathological pattern may in some way serve as an aid to diagnosis.

Diagnosis

From a practical aspect, the history of the herd is taken into consideration, and in herds in which brucellosis and trichomoniasis can be rulled out, it is thought that *V. fetus* infection may be suspected. However, Cotton[10] reported that Buck and Creech isolated pure cultures of Vibrio from aborted fetuses of four cows and that abortion bacilli were found to be present in the uterine material of one of these and in the milk of another soon after abortion. All reacted to agglutination tests for brucellosis, two of them having acquired the reactions since the beginning of the pregnancy that was terminated by abortion.

Inasmuch as fetuses under three months usually are expelled with membranes intact, they may be placed in a clean container. In the case of six-to-nine-month fetuses, the stomachs can be tied off at the duodenum and in the region of the esophagus adjoining the cardia. The specimen taken in this manner, along with a blood sample drawn from the affected animal, may be packed for shipment. If the entire fetus is brought directly to the laboratory, a more satisfactory examination can be made.

The following laboratory methods are used at the present time:

1. *Cultural Examination*: Amniotic fluid, macerated tissue of small fetuses, and stomach fluid of larger fetuses are used to inoculate tubes of thiol medium which are incubated for three to six days at 37.5 C.

2. *Direct Microscopic Examination*: Materials used for making cultural examinations may also be used to prepare slides for demonstration of the organisms. Numerous actively motile organisms have been observed in wet mounts of material from the true stomach. Wright's strain, dilute carbol-fuchsin, or the Gram-stain may be applied to prepared slides for microscopic examination.

Fig. 1. Photomicrograph of Vibrio fetus (app. 2,000X)

3. *Examination of Serum by Agglutination*: Plastridge and co-workers[8,11,12] have reported on the use of the agglutination test as applied to *V. fetus* infection in cattle. Blood samples were taken in the usual manner. Antigen made from a culture of this microorganism was used for the tube agglutination test. Blood serums giving partial agglutination in dilutions up to and including 1:200 were classed as negative, those giving complete agglutination in the 1:200 dilution and partial in the 1:400 dilution as suspicious, and those giving complete agglutination in dilutions of 1:400 or higher as positive. Blood serums are most likely to give a positive agglutination test at the time of abortions. Titers receded in many positive reactors and became negative in less than six months. The presence of high agglutination blood serum titers in bulls was also observed.

Control and Treatment

At the present time, control measures involve the general principles of preventive veterinary medicine. Animals which abort and those which are about to abort should be segregated from those which are apparently normal. The soiled litter should be collected

and destroyed and a disinfectant liberally used on the site of the abortion. Interesting clinical observations and experiences have been reported recently by Moore[13] and Roberts, *et al.*[14] The extent to which *V. fetus* infection is a transitory and self-limiting disease will be determined by further research and clinical experience. Herrick[15] has reported that infection can be carried by coitus from one female to another, and in some instances the bull never recovers but remains as a carrier. Sjollema, *et al.*,[16] have made isolations of the organisms from the semen of two bulls and their subsequent findings have shown infection to be a venereal disease. In view of the high blood serum agglutination titers and the isolation of *V. fetus* from bulls, recognition must be given the male as an important factor in the transmission, whether by natural service or artificial insemination.

Much work has yet to be done before definite statements can be made as to treatment.

However, Haubrich[17] reported that streptomycin is showing encouraging results at the present time. In a recent communication,[18] he advocates the use of 1 gm. of streptomycin diluted with 50 to 100 cc. sterile water or normal saline warmed to body temperature. This solution is infused into the body of the uterus using a standard inseminating tube with a 100 cc. syringe attached by means of a rubber adapter. The infusion is given at the onset of heat in which service is desired, and the cow may be inseminated 12 to 15 hours later. While some cows will settle if bred in the same heat, percentage of conceptions is higher if inseminated on the heat following streptomycin infusion.

Investigators led by Plastridge, Thorp, Stafseth, and others, are conducting research on the problem of vibrionic abortion. To them we look for further knowledge which will help to promote successful control and treatment of this disease.

Summary

1. Organisms possessing the general morphological and cultural characteristics of *V. fetus* have been found in three aborted fetuses in two herds of dairy cattle in Kansas.

2. Brucella organisms were not found in these fetuses, and the cattle affected had a history of being brucellosis-free.

3. Sheep were not in contact with the dairy herds involved.

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Columbia University physicians (reporting in the *Jour. Am. Med. Assn.*, Aug. 12, 1950), state that excellent results were obtained with terramycin in the treatment of 18 cases of lobar pneumonia and seven of atypical or virus pneumonia.

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A government patent has been issued on a cowtail holder.

Actinomycosis—A New Disease Of Turkeys

J. F. OLNEY, D.V.M., M.S., Omaha, Nebraska

THE purpose of this article is to report a relatively new or, as yet, rarely seen disease of turkeys which heretofore has not been recorded.

In June 1949, the writer's attention was called to an outbreak occurring in a flock of about 9,000 poults, six weeks of age, divided into lots of about 300 each. The infection was confined to three lots until the poults were put on range at about eight weeks of age. The infected units were purchased from an outside source as day old poults, while the remainder were hatched locally. The mortality of the locally hatched poults was well below average until they were placed with the affected birds on range. This might suggest a possibility of poults being infected when purchased.

The poults were moved rapidly over a wide range in an attempt to control the disease, without success. Three or four weeks after the onset of the disease the mortality reached 100 poults a day, then gradually tapered off during the season to about 20 birds a day at market time. The grower estimated approximately 45% mortality for the season. When the birds were marketed in December over 10% showed lesions of the disease.

The writer purchased 100 poults from the grower about the time the disease started. These poults were placed in small wire cages with one inch mesh wire floors, and were fed and watered from the outside of the cages. Of these 100 birds, 65% either died or were killed showing lesions of the disease.

Symptoms

The symptoms of the disease were not particularly characteristic. However, in the early infection, the fecal discharges were thin and white in color. The ground occupied by the flock was conspicuously covered with white droppings. Birds surviving the early infection became weak and had a yellowish diarrhea for a week or ten days before death. There was no evidence of the sulfur colored droppings so commonly seen in blackhead.

Gross Pathology

When the disease was first observed, the livers were speckled with small pin point spots which soon developed into hard, well defined, rounded nodules, yellowish-white in color, resembling early tubercular lesions in the liver of a fowl. A few cases were observed without cecal lesions but the majority had very large ceca engorged with caseous cores somewhat resembling cecal coccidiosis of chickens. The liver lesions in birds that survived the early infection varied in size up to ¾ inch. The largest lesions were found in birds six or seven months of age. These lesions were irregularly rounded nodules protruding from the surface of the liver, and throughout the parenchyma of the liver. On section, the nodules appear uniformly caseated and surrounded by a well defined capsule, sharply demarcated from the surrounding tissue. The ceca of birds which survived the early infection returned to a functioning condition, the cecal core disappeared and nodules were formed which resembled those in the liver protruding from the cecal wall. In a few cases the nodules were observed in the large intestine. In one bird a similar nodule was found in the muscles of the leg, in another on the ribs, and in another bird a nodule was located midway between the pharyngeal orifice and the crop, and one at the esophageal-proventriculus junction. Otherwise the lesions were confined to the liver and ceca. No lesions were found in the small intestines, spleen or lungs.

Histopathology

One report stated that histologic examination of the specimens showed that the circumscribed nodular lesions in the liver and cecal wall consisted of a dry mass of necrotic exudate and tissue debris surrounded by a narrow zone of inflammatory reaction containing many giant cells. Further, that no acid-fast bacteria were seen in the lesions, in fact, no bacteria nor protozoa of any kind were identified. However, it was thought that the pathological-anatomical characteristics of the lesions were more suggestive of a bacterial than protozoan infection.

Another source advised that upon examination of two specimens, sections of the ceca of these birds revealed ulceration of the mucosa with rather intense granulomatous prolifera-

tion of the submucosa with focal areas of necrosis and intense lymphocytic infiltration. Special stains for bacteria and fungi failed to reveal any organisms considered significant.

Sections of this bird revealed very intense inflammation of the submucosa with erosions of the mucosa in many places. There were large areas of necrosis as well as inflammatory infiltration. The musculoris was also affected, and in a few places lesions were seen just under the serosa. In the liver there were large areas of necrosis surrounded by granulation tissue and collars of lymphoid cells. Special stains for acid-fast bacteria, gram-positive bacteria, and fungi all failed to reveal significant organisms. The microscopic lesions in these cases were suggestive of histomoniasis, but no organisms could be demonstrated.

Fig. 1. Actinomycosis of the liver, ceca and cloaca of turkey. The lesions are hard, more or less round, and extend above the surface of the organ. Lesions are found throughout the liver tissue.

Discussion

It became apparent from the start, that if the disease was one commonly found in turkeys, it was an atypical form. Microscopic examination of the cecal contents of birds which had been maintained under strict laboratory conditions failed to reveal histomonads or trichomonads. Smears from the liver nodules were negative for acid-fast and other organisms. Numerous cultures from the livers were also negative.

As these preliminary examinations failed to reveal the cause of the infection, specimens were sent to a number of laboratories. The diagnoses received were nearly as numerous as the laboratories reporting on the specimens. The principal diseases named were tuberculosis, blackhead, mycosis, and trichomoniasis.

Histomonads could not be demonstrated by microscopic examination of fresh smears from the ceca or from microscopic study of liver sections in any of the birds kept under laboratory conditions as outlined above. A number of birds had liver lesions and no cecal lesions, while in blackhead, cecal lesions are always primary to those in the liver. The liver lesions are crater or convex in shape on the liver surface while these lesions were very hard, oval and protruded above the liver surface.

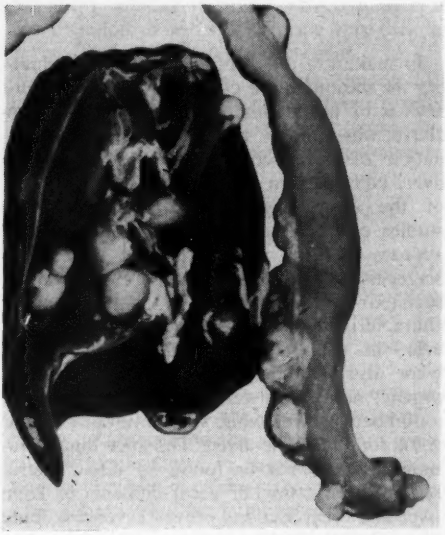

Fig. 2. Advance case of actinomycosis of turkey. The lesions grow larger and larger until death of the bird occurs.

During eight years of research on histomoniasis at the University of Nebraska, Van Es and Olney,[1] made postmortem examination on 580 positive cases and hundreds of others have been observed by the writer from the field without finding a single case of such lesions which has been referred to as atypical blackhead. This does not signify that lesions like those described above have not been observed in other parts of the country, but it hardly seems possible that histomonads would consistently produce such lesions in an outbreak.

Allen[2] (1941), reported *Trichomonas gallinarum* as one cause for enterohepatitis in

turkeys. "Liver lesions in trichomonad enterohepatitis appear as granular cream-colored areas of necrosis with irregular outlines and are level with or raised above the liver surface. Size of these lesions ranges from pin point to ¾ inch." The liver lesions described by Allen answer the gross description for the disease under discussion. However, in making a microscopic examination of a large number of ceca of birds kept under strict laboratory conditions, no trichomonads were found. Dr. W. R. Hinshaw[3] stated he had observed a number of cases of what appeared to be an identical disease which he diagnosed as being caused by a species of Actinomyces. Dr. E. L. Jungherr,[4] stated that in all his experience with turkey diseases at the University of Connecticut, he had never observed such lesions.

Diagnosis

In making a differential diagnosis, eliminating the various more common diseases of turkeys is of utmost importance. This, as shown above, was done by direct microscopic examination of cecal contents, smears from the liver, culture from the liver in various stages of the disease and from histopathological studies of tissues from the liver and ceca. It appears that the most important differential diagnosis is with histomoniasis, as lesions associated with this condition have identical characteristics in both the liver and ceca. However, in the case under discussion, lesions were also found in a few cases, in other organs; no lesions were found in the ceca of a number of birds while well developed lesions were found in the liver. The fact that histomonads could not be found by direct microscopic examination of cecal contents or from liver and cecal sections proves beyond a doubt histomoniasis can be satisfactorily eliminated. As shown above, tuberculosis and trichomoniasis were also eliminated.

In a further search for a causative organism, a number of nodules were ground up in a mortar and placed in postassium hydroxide in an incubator over-night to dissolve. A microscopic examination of the material revealed club shaped organisms and filaments which were identified as Actinomyces. It appears from these findings that the disease may be identical to that found by Hinshaw.

Culturing the Actinomyces and reproducing the disease with the cultures is left for future research.

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Lactogenic Activity of Stilbestrol

That diethylstilbestrol is a highly effective lactogenic agent is illustrated in the report of two cases in cows. (*Jour Am. Vet. Assn.*, 117: 149 [Aug.], 1950.)

In order to reduce cost of maintenance of a well-bred two-year-old open Holstein heifer for the period to parturition, artificially induced lactation resulted in a peak production of 14 lb. of milk daily, and a total of 1,461.2 lb.

The second case reported concerned a five-year-old Jersey family cow. Evidences of approaching parturition were not exhibited and milk production ceased. Rectal examination revealed a four to five-month-old mummified fetus. Stilbestrol injection effected expulsion of the fetus and estrus seven days following the initial treatment. This cow produced 12 to 16 lb. of milk daily during the first six months of her artificially induced lactation, was rebred two months later, conceived and carried the calf to term.

This report, calling attention to the lactogenic activity of stilbestrol, emphasizes the importance of adequate doses. The daily administration of 20 mg. until lactation commenced, and every other day until it had reached its maximum, then discontinued, proved adequate in the cases reported. In the first case, 17 daily doses were given and eight doses on every second day, a total of 25 doses, to extend the treatment schedule for approximately 30 days. In the second animal treated, one 50 mg. dose was given five days prior to initiating treatment series, after which 20 mg. were given daily for six days and every second day for ten days. The treatment in this instance consisted of 12 doses. In neither case did the repeated injections of stilbestrol impair breeding efficiency of the animals, as both were rebred and conceived soon after treatment was discontinued.

Penicillin Milk Levels In Cows Following Intramammary Administration*

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DURING recent years penicillin has become the product of choice for the treatment of many forms of infectious mastitis. As a result, many new medication forms have been developed. These medication forms are important in the practical use of the drug in the field. In addition to being convenient to use, it is essential that they be effective. The effectiveness of penicillin is determined, in part, by the milk level that is attained after penicillin administration. This study was undertaken to determine the penicillin-in-milk curves when varying amounts of penicillin in different medication forms were introduced into the cow's udder.

Determining the Penicillin Level of Milk

The serial dilution method of assay for penicillin in body fluids, presented by Randall, Price and Welch, [5] was used in these experiments. This technic was applicable to milk samples but greater care was required in checking for the *Bacillus subtilis* pellicle on each tube. Solutions containing known amounts of penicillin in sterile whole milk were prepared and tested by this method. The results obtained in the test accurately determined the known amount of penicillin present unless the quantity was in the range of 0.03 to 0.12 units per cc. and depending upon color and fat content of the milk being tested. In this lower range, the agar cup method was used. Even with this technic it was at times difficult to accurately measure levels of 0.03 units per cc.

A procedure was devised to make measurements in this very low range; its accuracy was checked on known penicillin solutions in milk. The technic consisted of removing the gravity-formed cream layer from 10 cc. of milk, by suction, then adding 0.4 cc. of commercial rennet solution, and incubating for two to four hours in a slanted position. If insufficient milk serum was formed on the slant, the sample was centrifuged. The milk serum was sterilized by passing through a sterile Swinney filter adapter with a Seitz-type of filter disc. A narrow plunger, precision type of syringe (1 or 2 cc. capacity) yielded the most effective pressure for filtration. The sterile filtrate was then assayed by the serial dilution method.

After these technics were successfully checked for accuracy, they were used to assay milk samples collected aseptically from cows following the intramammary administration of penicillin.

Collecting and Handling of Milk Samples for Assay

Milk samples (10 cc.) were aseptically collected at sampling time (prior to milking the cow) by discarding two streams of milk into a strip cup, disinfecting the udder and teats and then milking directly into a sterile tube. In a number of cases, the normal udder microflora interfered with the reading of the test results. Subsequently, the samples were placed in flowing steam for ½ hour and then tested. Results obtained confirmed the work of Watts, *et al.*,[6] that such a heating process immediately prior to testing did not affect the penicillin level.

Cows Used

Cows at the end, middle, and beginning of the lactation period were used in this study. They were housed in a good barn and were cared for under good dairy conditions. All milking was done by hand at regular intervals. Each cow was milked daily at 7 a.m. and 5 p.m.

Penicillin Used for Udder Administration

The penicillin which was dissolved in sterile distilled water or dispersed in the water-in-oil emulsion (penicle, Wallace Laboratories) for administration was crystalline sodium penicillin G. The same penicillin was placed in a base

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and fashioned into a bougie and used as bougie-M (mastics, Martin Laboratories) while bougie-P (penstix, Wyeth, Inc.) contained crystalline procaine penicillin G. The ointment (1/12 oz.) contained sodium penicillin G in a petrolatum base (ointment P.D., Parke, Davis & Co.).

The procaine penicillin in oil (depo-penicillin, Upjohn), (CSC, Commercial Solvents Corp.) was a sterile suspension of micronized (particle size of less than five microns) procaine penicillin G in refined peanut oil with 2% (w/v) of aluminum monostearate added. Crystalline procaine penicillin G was also obtained in sterile crystalline form containing a dispersing agent (diurnal-penicillin, Upjohn). When 4.4 cc. of sterile water was added to each vial containing 1,500,000 units there resulted 5 cc. of solution containing 300,000 units of penicillin per cc.

The soluble-repository penicillin (SR, Parke, Davis & Co.) was obtained in crystalline form containing 2,000,000 units per vial. When 4.2 cc. of sterile water were added per vial, 5 cc. of solution containing 400,000 units per cc. (300,000 units of procaine penicillin G and 100,000 units of sodium penicillin G) resulted.

To administer the larger amounts of penicillin per quarter, larger volumes of the products were administered.

Penicillin Milk Levels Near the End of the Lactation Period

Penicillin values obtained on the milk samples collected from cows near the end of lactation when very little dilution occurred are presented in table 1.

The volume of water used as a vehicle was inversely related to the initial level of penicillin obtained. The larger the volume of water, the more dilution at the six-hour checkup; therefore, a lower number of units of penicillin per cubic centimeter were obtained. The volume of water apparently had very little effect on the number of hours that penicillin could be detected in the milk, but 50,000 units of sodium penicillin G in water gave a measurable level for 24 hours longer than did 25,000 units, and in this case the 100,000-unit dose gave a measurable level for 24 hours beyond that obtained when 50,000 units were used. Packer[4] obtained similar results when he used 50 cc. of saline as the vehicle for the injection of penicillin.

The bougie containing only 25,000 units of procaine penicillin G yields milk levels as long as and almost as high as did the 100,000 units of sodium penicillin G in water. These values were somewhat higher than those reported by Barnum[1]. The bougie containing 100,000 units of sodium penicillin G gave a measurable (0.03 units/cc.) milk level for 84 hours. This same level at 84 hours was attained when 25,000 units of sodium penicillin G in ointment form were used. The penicillin levels during the first 24 hours, however, were lower when the ointment was used (64 units/cc. at six and 12 hours) as compared to 1,600 and 800 at these same times in bougie form.

Penicillin Milk Levels in Cows during the Middle of and at the Start of the Lactation Period

Although there is the least dilution by milk of the penicillin administered to cows near the

TABLE I. THE PENICILLIN MILK CURVE ATTAINED IN COWS NEAR THE END OF THE LACTATION PERIOD WHEN VARIOUS MEDICATION FORMS OF PENICILLIN WERE PLACED INTO THE UDDER.

Vehicle or product	Units of penicillin	Hours after the administration of penicillin								
		6	12	24	36	48	60	72	84	96
		Units of penicillin per cc. of milk*								
Water 50 cc.	25,000	256	64	1	0.12	—0.06				
Water 100 cc.	25,000	128	64	0.5	0.12	—0.06				
Water 10 cc.	50,000	200	64	16	2	0.5	0.06	—0.06		
Water 50 cc.	50,000	128	32	4	0.5	0.12	0.06	—0.06		
Water 10 cc.	100,000	1600	400	32	8	1	0.5	0.25	0.06	—0.06
Water 50 cc.	100,000	800	200	16	2	0.5	0.25	0.06	—0.06	
Water 100 cc.	100,000	800	128	8	1	0.5	0.06	0.03	—0.03	
Bougie-P	25,000	512	128	8	0.5	0.5	0.06	0.03	—0.03	
Bougie-M	100,000	1600	800	16	1	0.5	0.25	0.03	0.03	—0.03
Ointment-P.D.	25,000	64	64	16	1	0.5	0.5	0.12	Not run	

*—before a value means less than that amount of penicillin present.

TABLE 2. THE PENICILLIN MILK LEVELS FOLLOWING THE ADMINISTRATION OF VARIOUS PENICILLIN PRODUCTS AND DOSAGE LEVELS TO COWS DURING THE MIDDLE OF LACTATION

TABLE 2. THE PENICILLIN MILK LEVELS FOLLOWING THE ADMINISTRATION OF VARIOUS PENICILLIN PRODUCTS AND DOSAGE LEVELS TO COWS DURING THE MIDDLE OF LACTATION

Vehicle or product	Units of penicillin used	Hours after the administration of penicillin												
		6	12	24	36	48	60	72	84	96	120	144	192	216
		Units of penicillin per cc. of milk												
Water														
10 cc.	25,000	200	8	1	0.06	—0.06								
50 cc.	25,000	100	4	0.5	—0.06									
100 cc.*	25,000	64	2	0.06	—0.06									
10 cc.	50,000	400	16	1	0.25	0.06	—0.06							
50 cc.	50,000	400	8	0.5	0.1	0.03	—0.03							
100 cc.*	50,000	200	4	0.12	0.06	—0.06								
10 cc.	100,000	400	32	4	1	0.25	0.12	—0.06						
50 cc.	100,000	400	8	2	1	0.06	—0.06							
100 cc.*	100,000	200	4	1	0.12	0.03	—0.03							
SR Water														
5 cc.**	25,000	320	32	2	0.5	0.25	0.06	—0.06						
0.25 cc.	100,000	800	80	1	0.5	0.5	0.06	0.06	—0.06					
1.0	400,000	3200	800	16	4	1	0.12	0.12	0.03	—0.03				
Bougie—P	25,000	200	64	0.5	0.06	0.03	—0.03							
Bougie—P	50,000	400	64	2	0.5	0.06	—0.03							
Bougie—M	25,000	200	8	1	0.06	—0.06								
Bougie—M	50,000	400	32	1	0.12	0.03	—0.03							
Bougie—M	100,000	400	64	2	0.5	0.03	0.03	—0.03						
Bougie—M	200,000	800	320	8	1	0.12	0.06	—0.06						
Ointment—P.D.	50,000	128	64	2	1	1	0.5	0.06	0.06	—0.06				
Ointment—P.D.	100,000	200	64	2	1	1	0.5	0.12	0.06	—0.06				
Water-in-oil emulsion														
20 cc.	50,000	320	64	1	1	0.5	0.06	0.03	—0.03					
20 cc.	100,000	400	100	2	1	0.12	0.06	0.06	—0.06					
20 cc.	200,000	400	64	1	0.5	0.12	0.06	0.06	—0.06					
Procaine penicillin														
in oil (CSC)	100,000	200	32	4	0.5	0.5		0.06		0.03	—0.03			
in oil (CSC)	200,000	640	320	32	2	1		0.12		0.06	0.03	—0.03		
in oil (Uj); (CSC)	300,000	1600	400	40	4	4		2		1	0.5	0.5	0.12	—0.06
Procaine penicillin														
in water (Uj)	100,000	800	200	2	2	0.25		0.06		—0.06				
	200,000	1600	800	8	1	0.5		0.12		—0.06				
	300,000	6400	1600	16	1	1		0.25		0.06	—0.06			

*slight swelling of quarter and a few flakes in the milk 6 hr. after administration

**The penicillin solution was prepared by adding 0.25 cc. of solution containing 100,000 units of penicillin to 20 cc. of water, thus 5 cc. of this solution contains 25,000 units.

end of lactation, it is not always possible nor desirable to postpone treatment until that time. Therefore, it is necessary to determine the penicillin level curves of the milk of cows throughout the lactation period. The data obtained from such a study during the middle of the lactation period are presented in table 2 and similar data obtained at the beginning of the lactation period during the period of greatest milk flow are found in table 3.

The larger the volume of water used as the diluent in the administration of the penicillin, the lower the penicillin concentration obtained at each testing period and the shorter the period of maintenance of a measurable level. This was true irrespective of whether 25,000, 50,000 or 100,000 units of penicillin were infused per quarter. Volumes of diluent of 50 cc. or less per quarter gave the best results. When 100 cc. were used, a mild acute local mastitis (slight swelling of the udder and flakes in the milk) resulted.

Considering the values obtained when 10 cc. of water were used as the diluent to administer 25,000 units of penicillin, measurable levels of penicillin were obtained in the milk for 36 hours at middle lactation and 24 hours at the start of lactation. When 50,000 and 100,000 units were infused in 10 cc. of water, measurable levels were present for 48 and 60 hours, respectively, at the middle and start of lactation.

The soluble-repository penicillin yielded higher and longer levels of penicillin in the milk when comparable quantities were administered. Thus 25,000 units of crystalline peni-

TABLE 3. THE PENICILLIN MILK LEVELS OBTAINED AT THE START OF THE LACTATION PERIOD

Vehicle or product	Units of penicillin	Hours after the administration of the penicillin							
		6	12	24	36	48	60	72	84
		Units of penicillin per cc. of milk							
Water									
10 cc.	25,000	64	4	0.06	—0.06				
50 cc.	25,000	32	2	0.06	—0.06				
100 cc.	25,000	32	1	0.06	—0.06				
Water									
10 cc.	50,000	100	4	0.12	0.03	—0.03			
50 cc.	50,000	200	2	0.06	0.03	—0.03			
100 cc.	50,000	32	1	0.12	0.03	—0.03			
Water									
10 cc.	100,000	128	8	0.5	0.06	—0.06			
50 cc.	100,000	50	1	0.06	0.03	—0.03			
100 cc.	100,000	64	1	0.12	0.03	—0.03			
Bougie—P	25,000	320	4	0.06	—0.06				
Bougie—P	50,000	200	8	0.06	0.03	—0.03			
Bougie—P	100,000	400	8	0.25	0.06	—0.06			
Bougie—M	25,000	50	8	0.06	0.03	—0.03			
Bougie—M	50,000	100	8	0.06	0.03	—0.03			
Bougie—M	100,000	64	4	0.12	0.06	0.06	—0.06		
Bougie—M	200,000	320	80	4	0.12	0.12	0.03	—0.03	
Ointment—P.D.	50,000	64	8	1	0.12	0.06	—0.06		
Ointment—P.D.	100,000	200	32	2	0.5	0.12	0.03	—0.03	
Water-in-oil emulsion									
20 cc.	25,000	4	0.5	0.06	0.06	—0.03			
20 cc.	50,000	32	16	4	0.03	0.03	—0.03		
20 cc.	100,000	50	16	4	0.06	0.06	—0.06		
20 cc.	200,000	64	16	1	0.12	0.06	0.03	—0.03	
SR									
Water 5 cc.*	25,000	4	1	0.25	0.06	0.03	—0.03		
Water 10 cc.*	50,000	8	2	0.25	0.06	0.03	—0.03		
Water 0.25 cc.	100,000	320	4	0.25	0.06	—0.06			
Water 1 cc.	400,000	800	16	2	0.25	0.06	—0.06		
Procaine penicillin in oil (UJ).									
0.33 cc.	100,000	100	10	2	0.12	0.06	0.03	—0.03	
0.66 cc.	200,000	320	80	8	1	1	0.03	—0.03	
1 cc.	300,000	3200	400	32	8	1	0.12	0.06	—0.06

*One cc. of reconstituted penicillin (400,000 units per cc.) diluted with sterile water for further dilution and then indicated amount, containing the desired number of units, were infused.

cillin G in water yielded 0.06 units per cc. of milk for 36 hours during the middle of lactation while the same amount of soluble-repository penicillin yielded levels of 0.06 for 60 hours. Similar values were obtained at the beginning of lactation for 24 and 48 hours, respectively, for the procaine penicillin G in water and the soluble-repository penicillin.

The bougie and ointment forms of penicillin were applied most readily because their use required only the previous proper disinfection of the teats of the cow. It is significant to note that the ointment maintained measurable milk levels of penicillin for 84 hours during the middle of lactation, irrespective of whether 50,000 or 100,000 units were used as compared to measurable levels for 48 to 60 hours when similar amounts of penicillin in bougie form were administered. At the end of the lactation period, the ointment levels continued for 60 hours compared to approximately 36 hours for the bougies. The six-hour levels of 200 to 800 units of penicillin per cc. of milk obtained in this study when from 25,000 to 200,000 units were administered were higher than the 46.6 unit per cc. reported by Bolton, *et al.*[2].

The water-in-oil emulsion vehicle yielded measurable levels for 72 hours during the middle of lactation; this compares favorably with the results with soluble-repository penicillin. These levels confirmed the results of Foley, *et al.*,[3] and were higher than those obtained with water solutions and bougies of penicillin G and procaine penicillin G. The same trend, except for a shorter time, was found at the beginning of the lactation period.

During the middle of lactation, the water injectable procaine penicillin G yielded levels similar to those obtained with the soluble-repository form, but the procaine penicillin G in oil (with aluminum monostearate) gave measurable levels for a much longer period of time. When 300,000 units of procaine penicillin G in oil were injected into the quarter, milk levels of 0.5 units or more resulted for 144 hours and at 192 hours, 0.12 units of penicillin per cc. were still present. To make the injection without wasting penicillin, a 20-gauge needle was cut to about ½ inch in length and used as the test cannula.

In the cows during the full flow of milk, 100,000 or 200,000 units of procaine penicillin G in oil yielded 0.03 or more units per cc. for 60 hours, while 300,000 units per quarter produced levels of at least 0.06 units per cc. of milk for 72 hours. Thus, it can be seen that the amount of milk produced by the cow influences the penicillin milk levels; the longest and highest levels are attained near the end of the lactation period.

Summary

Penicillin milk level curves obtained after the injection into the udder of a variety of penicillin medication forms into cows at the end, during the middle and near the start of the lactation period, are presented. In general, the highest levels were obtained at the end of lactation and the lowest levels at the beginning of the lactation period.

The procaine penicillin in oil with aluminum monostearate gave measurable levels for the longest period of time. When 300,000 units were administered per quarter a measurable level of penicillin was obtained for 72 hours at the beginning of the lactation and for 192 hours during the middle of the lactation period. No other product studied maintained a measurable level for a similar period of time.

When 25,000 units or more of penicillin of any medication form were administered to cows in all stages of lactation, measurable milk levels were obtained at the 24-hour sampling period in each case, and for longer periods of time during the latter part of the lactation period.

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Vitamin C in Milk

As secreted, one quart of milk contains approximately 20 mg. of ascorbic acid, according to the National Dairy Council. This quantity is not affected by the rations and even when massive doses are fed in crystalline form, remains relatively constant. Ascorbic acid is synthesized in the rumen of cattle, sheep and other ruminants. There are small breed and individual variations in vitamin C content of milk, but no consistent differences have been demonstrated for the stage of lactation nor age of producing animals.

A Dilution Method For The Milk Ring Test In Bovine Brucellosis Detection*

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A ROUTINE method of detecting new brucellosis infections in dairy herds without affecting the management routine long has been needed. Monthly or bimonthly bleeding is expensive and, in the experience of many dairymen, disturbs production. The milk ring test would, if adaptable to individual cow testing, materially aid in an effective control program.

The milk ring test for the detection of bovine brucellosis was first described by Fleischhauer[1] in 1937. The test he developed would detect agglutinins in the milk from one infected animal even though it was pooled with the milk of nine other cows. Norell and Olson[2] showed that they could dilute one volume of milk from Brucella-infected herds with as much as 40 volumes of milk from brucellosis-free animals without losing the reaction. Darnell[3] reported a number of distinct milk ring reactions while working with milk from individual cows which were negative to the blood serum agglutination test. Bruhn[4] stated that abnormal udder secretions exhibited a far higher titer than the blood agglutination titer and that these same abnormal secretions from cows with Brucella-negative blood serum often showed positive ring tests. These abnormal secretions were from cows which were recently fresh, dry, or had mastitis. Bruhn, in the same study, reports that the variation in the cream-rising ability of milk is one factor that may contribute to the disagreement between blood and milk tests. His observations were made in cases where the blood serum was strongly positive and the milk ring test was negative. These same negative milk samples gave positive tests when mixed with milk from negative cows. Roepke[5] concluded that partial freezing of milk sufficiently alters the physical characteristics to cause + and ++ positive reactors in otherwise negative milk.

This study was designed to investigate the factors that interfere with the accuracy of the ring test when applied to individual cow's milk and, if possible, to remove those extraneous factors by altering the milk ring technic. As indicated earlier, Bruhn[4] observed that abnormal secretions may produce false positive reactions and that certain individuals also produced milk that was negative to the test even though they carried strong blood titers to Brucella.

This study was conducted in conjunction with a bovine mastitis investigation. The mastitis study involved four herds comprising 85 milking cows. These herds were following a brucellosis blood testing program; calf vaccination was practiced in three, and two herds maintained one or more non-vaccinated reactors. A total of 1,849 quarter samples were tested for mastitis, using the Hotis test and microscopic methods. Remaining milk from these quarter samples was used for milk ring studies. After the quarter tests were made, samples from each cow were pooled and tested. A complete history of subclinical and clinical mastitis, udder palpations, carrier animals and mechanical injuries to the udders was obtained. Figure 1 illustrates the tendency for false positive reactions to develop in undiluted quarter sample milk when mastitis is present. These reactions did not appear to be associated with any specific type of mastitis. Figures 2 and 3 are shown for contrast.

Early in the study it was noted that a dilution technic would remove the effect of mastitis as a source of false positives. This was often accomplished by mixing the milk from all four quarters. In other cases, where two or more quarters were involved, further dilution with negative milk was required, but rarely beyond a 1:5 dilution.

In order to study the dilution technic under field conditions a total of 575 additional milking cows were tested in 31 north central and eastern North Dakota herds.

In addition to quarter sample, composite and dilutions of milk ring tests on each cow, strip cup, udder palpation and chloride examinations were made. The chloride technic described by Holm[6] was employed.

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Reported in this study are the results of data collected from 35 herds, 24 of which contained animals which reacted to the blood serum agglutination test. A total of 660 individual cows were tested, 111 of which were beef animals.

Methods and Procedure

In these 35 herds, 4,115 quarter sample tests were made. A total of 1,044 tests of the quarter sample composite of each animal was tested undiluted together with sufficient dilutions to reach a negative end point.

The dilution technic used employs a constant amount of antigen, a decreasing amount of test milk and an increasing amount of diluent; the diluent being a negative milk se-

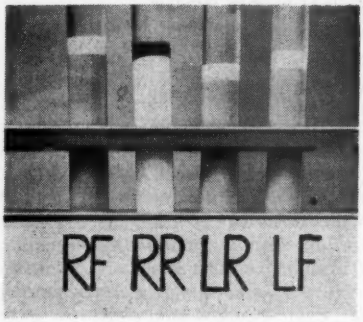

Fig. 1. Quarter sample tests from a blood serum negative animal. This animal had clinical mastitis in the right rear quarter.

lected for its lack of reaction and high butterfat content. The negative diluent can be preserved with formalin and stored under refrigeration without affecting the test. The total volume of the test was maintained at 1 ml. Dilutions of 1:1, 1:5, 1:10, 1:50, 1:100, 1:200, 1:300, 1:400 and 1:800 were employed. As soon as the dilutions were made, a drop of standard milk ring antigen (prepared by the Bureau of Animal Industry) was added to each tube and thoroughly mixed. The tubes were then centrifuged at 1,500 r.p.m. for ten minutes. Readings were made according to the standard of Bruhn[7] and Roepke[6].

The centrifugation technic used by Jahala and Low[8] of the State-Federal Brucellosis Laboratory, Bismarck, N. Dak., has proved to be a definite contribution to this technic. Comparisons of centrifugation, cold incubation at 4 C. and incubation at 37 C. indicate that readings were more definite and clear-cut with the centrifugation technic. They also carry out further in the dilutions. There appeared to be less time or tendency for decolorization of the milk fraction which, according to Winther and Hanson,[9] is due to bacterial growth and action.

At the time milk samples were collected for mastitis and ring test studies, history on each animal was obtained. These histories were, whenever possible, supplemented with informa-

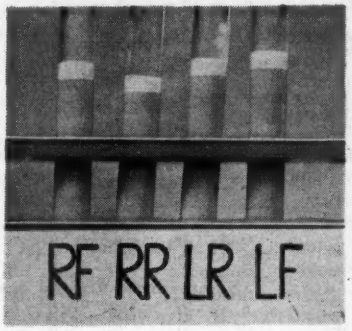

Fig. 2. Quarter sample tests from a blood serum negative cow. A slight subclinical mastitis was present in the two front quarters.

tion obtained from the practicing veterinarian and from previous blood test charts. Blood samples were drawn on all animals at the time milk samples were taken or within a short interval. These blood samples were collected by state or federal employees. Table I shows the results of this investigation with all animals classified according to blood reaction and his-

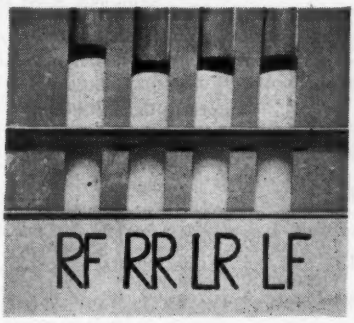

Fig. 3. Quarter sample test from a blood serum reactor animal.

tory. No classification was deemed necessary for mastitis-affected cows since with only one exception they became negative at dilutions of 1:10 or less. This one exception was a calf vaccinate that reacted in a dilution of 1:100 and that had been fresh less than 24 hours with her first calf, coming in with a severe streptococcic mastitis. The combination of mastitis, vaccination and colostrum carried her milk titer to a + at a dilution of 1:400. Subsequent monthly tests on this animal showed a titer of + at 1:10.

TABLE 1. MILK RING DILUTION REACTIONS SEGREGATED ACCORDING TO BLOOD SERUM TITER

Stage of Lactation	Milk Ring Tests Positive at + or higher											
	Neg.	1	1:1	1:5	1:10	1:50	1:100	1:200	1:300	1:400	1:800	Total
Negative Blood Reaction — Not Vaccinated												
Dry	12	10	16	7	4	0	0	0	0	0	0	
Near Dry	8	2	2	0	0	0	0	0	0	0	0	
Fresh	46	9	2	0	1	0	0	0	0	0	0	
Milking	386	33	13	0	1	0	0	0	0	0	0	552
Negative Blood Reaction — Calf Vaccination												
Dry	0	0	0	2	2	0	0	0	0	0	0	
Near Dry	4	0	1	1	0	0	0	0	0	0	0	
Fresh	11	6	1	0	0	0	0	0	0	0	0	
Milking	144	31	4	0	1	0	0	0	0	0	0	208
Negative Blood Reaction — Adult Vaccination												
Dry	1	0	0	1	0	0	0	0	0	0	0	
Near Dry	0	0	0	0	0	0	0	0	0	0	0	
Fresh	0	0	0	0	1	0	0	0	0	0	0	
Milking	8	0	0	0	0	1	0	0	0	0	0	12
Negative Blood Reaction — History of Previous Infection or Reaction												
Dry	0	0	0	0	0	0	0	0	0	0	0	
Near Dry	0	0	0	0	1	0	0	0	0	0	0	
Fresh	0	0	0	0	2	0	0	0	0	0	0	
Milking	1	0	0	1	0	0	0	0	0	0	0	5
Suspicious Blood Reaction — Not Vaccinated												
Dry	0	0	0	1	0	0	0	0	0	0	0	
Near Dry	1	0	0	0	1	0	0	0	0	0	0	
Fresh	0	0	0	0	0	0	0	0	0	0	0	
Milking	9	2	1	0	0	0	1	0	0	0	0	16
Suspicious Blood Reaction — Calf Vaccination												
Dry	0	0	1	0	1	2	0	0	0	0	0	
Near Dry	0	1	1	1	1	0	0	0	0	0	0	
Fresh	1	5	3	0	0	0	0	0	0	0	0	
Milking	38	16	7	2	1	0	0	0	0	0	0	81
Suspicious Blood Reaction — Adult Vaccination												
Dry	0	1	0	0	0	0	0	0	0	0	0	
Near Dry	0	0	0	0	0	0	0	0	0	0	0	
Fresh	0	0	0	0	0	0	0	0	0	0	0	
Milking	6	1	1	1	0	0	0	0	0	0	0	10
Suspicious Blood Reaction — History of Previous Infection or Reaction												
Dry	0	0	0	0	0	0	0	0	0	0	0	
Near Dry	0	0	0	0	0	0	0	0	0	0	0	
Fresh	0	0	0	0	0	0	0	0	0	0	0	
Milking	0	2	0	0	1	0	1	0	0	0	0	4
Positive Blood Reaction — Not Vaccinated												
Dry	0	0	0	0	0	0	0	0	0	0	3	
Near Dry	0	0	0	0	0	0	0	0	0	0	0	
Fresh	0	0	0	0	0	0	0	1	0	0	0	
Milking	0	0	0	0	0	3	4	5	5	6	3	30
Positive Blood Reaction — Calf Vaccination												
Dry	0	0	0	0	0	0	0	0	0	0	0	
Near Dry	0	0	0	0	0	0	0	0	0	0	0	
Fresh	0	0	1	0	2	1	0	0	0	1	0	
Milking	6	3	8	6	4	0	1	0	0	0	0	33
Positive Blood Reaction — Adult Vaccination												
Dry	0	0	0	0	1	0	0	0	0	0	0	
Near Dry	0	0	0	0	0	1	1	0	0	0	0	
Fresh	0	0	1	0	1	0	0	0	0	0	1	
Milking	3	1	2	1	4	1	0	0	0	2	0	20
Positive Blood Reaction — History of Long Standing Infection												
Dry	0	0	0	0	0	0	0	0	0	0	0	
Near Dry	0	0	0	0	0	0	0	0	0	0	3	
Fresh	0	0	0	0	0	0	1	0	0	0	0	
Milking	0	0	2	2	5	5	3	2	1	1	2	27
Total	685	123	67	26	35	14	12	8	6	10	12	998

Table 1 classifies the results of 998 cow tests. The cows were classified according to blood serum and milk ring reactions, and history, vaccination, previous positive reaction and stage of lactation. Animals giving a positive blood serum test in a dilution of 1:100 were classified as reactors. Cows with incomplete agglutination in a dilution of 1:100 were classed as suspects and animals with no agglutination in dilutions of 1:50 were designated as negative. All milk ring tests were run to a dilution of negative. As an example, if a milking, blood serum agglutination negative cow gave a ++++ reaction at "1" (composite), a ++ at 1:1, a + at 1:5 and — at 1:10, she would appear in table 1 in the group showing a reaction at 1:5 which is the cow's highest reaction.

Discussion of Table I

Seven hundred seventy-seven tests from animals with negative blood reactions, with only one exception, reacted no higher than the 1:10 dilution when the milk ring test was applied. These findings would indicate that stage of lactation and mastitis do not interfere with the milk ring test when dilutions are used. It should be pointed out that 122 of the 660 animals studied gave abnormal milk in one or more quarters and there were 61 blind or nonfunctioning quarters. The incidence of mastitis according to Hotis and chloride tests, udder palpation, and microscopic examination would be much higher.

Four in the group of 111 cow tests with suspicious blood titers reacted higher than the 1:10 dilution. Two of these were calf vaccinates and one had a history of previous reactor status. One cow, a non-vaccinate, reacted in a dilution of 1:100. No subsequent test was made. Two other animals which had had suspicious blood reactions gave milk ring reactions of 1:200 and 1:800, respectively. In both instances, the blood tests had been made two weeks prior to the collection of the milk samples and blood collected within three days of the milk test placed both animals in the reactor group.

A total of 110 cow tests appear in the group of reactors. All of the animals that had not been vaccinated gave milk ring reactions in dilutions of 1:50 or higher. As indicated earlier, one calfhood vaccinated animal, which was just fresh and had mastitis, carried a +++ blood reaction, gave a milk ring reaction in a dilution of 1:400. On subsequent tests her reaction was 1:10 and her blood titer receded to a + at 1:50 within six months. The majority of the calf vaccinates gave milk ring test reactions similar to those observed in the negative and suspect calf vaccinate groups.

The adult vaccinate reactors and those with known long standing infection would fit no specific pattern. One-third of those in the latter group reacted in dilutions below 1:50 which may indicate they are becoming "cease reactors or self cleaned" animals, as reported by Seit and Jorgensen[10].

The adult vaccinated animals were in infected herds and even though all were negative at the time of vaccination, it is reasonable to suspect that some developed the disease. In the adult vaccinate reactor groups appears one animal that had been vaccinated seven months before the milk ring test was made; she reacted at a 1:800 dilution.

In the course of this investigation, two herds were studied in which unofficial adult and calf

TABLE 2. BLOOD AND MILK TESTS ON CATTLE EITHER KNOWN OR SUSPECTED OF UNOFFICIAL VACCINATION. THESE NUMBERS COMPRISE TWO HERDS.

Stage of Lactation	Neg.	1	1:1	1:5	1:10	1:50	1:100	1:200	1:300	1:400	1:800	Total
Negative Blood Reaction												
Dry					1							1
Near Dry		1										1
Fresh	4											4
Milking	12		2	1								15
Suspect Blood Reaction												
Dry												0
Near Dry												0
Fresh	1											1
Milking	1	4			3							8
Positive Blood Reaction												
Dry								1				1
Near Dry											1	1
Fresh								1			1	2
Milking			2	1	4	2	1	1			1	12
Total	18	5	4	2	8	2	1	3			3	46

vaccination was admitted or suspected. These two herds comprise 46 animals and the findings are given in table 2 without discussion because accurate histories could not be obtained. A subsequent investigation by Dr. J. O. Foss of Minot, N. Dak., failed to substantiate the vaccination of 11 cows included in this table.

Discussion

Three types of udder secretions materially affect the milk ring test; they are milk from cows with mastitis, colostrum, and secretions from dry cows. The agglutination inhibition factor is also present in some types of milk. None of these factors, however, appear to interfere with the interpretations of milk ring dilution tests.

Mastitis can produce false positive reactions in quarter, composite, and herd milk. Usually this condition is noted in pooled herd milk only when the herd is small or the incidence of clinical mastitis is high. As indicated elsewhere in this paper, these false reactions disappear at dilutions of 1:10 or less.

Colostrum appears to carry a factor for decolorizing the milk fraction in the ring test. This is often noted in dilutions up to 1:10. If there is an actual + reaction present, the test gives the appearance of a ++++ reaction. Colostrum has a low pH which may account for the decolorization; however, there is a possibility that a reductase type enzyme plays a part in this reaction. Colostrum, when mixed with herd milk, may also produce positive ring tests when actually the herd is negative to blood tests.

Secretions from the dry udder often contain no butterfat, consequently give no reaction in quarter and composite tests. However, satisfactory test results are obtained in dilutions of 1:1 or higher.

Agglutination inhibition does not appear to have received adequate attention in the past. Bruhn[4] noted an inhibition of milk ring agglutination in some animals with strong blood titers. This same phenomenon was noted in the lower dilutions in this study, not only on individual cow samples but also in the pooled herd sample of an occasional heavily infected small herd. The condition appeared to be most pronounced in blood serum reactor animals that were dry, nearly dry or producing colostrum. These same factors appeared to be present when the condition was noted in herd composite samples. The inhibition observed in this study could not be ascribed to poor cream-rising ability since the negative diluent always showed a good cream zone following centrifugation. The condition as noted in this study, appears to be similar to the agglutinoid or prozone phenomenon. In this study samples have shown + reactions in the composite, + in the 1:1 dilutions and then give ++++ reactions in higher dilutions.

Summary

1. A dilution technic for the brucellosis milk ring test is reported.

2. Results of the study indicate that the test can be applied as a routine method for brucellosis detection.

3. There is some evidence that the milk ring test will detect developing infection earlier than the blood serum agglutination test.

4. Results obtained by the milk ring dilution test in this study indicate that a high percentage of blood reactor vaccinates can be segregated from naturally infected animals. A much greater number of test animals must be studied to substantiate these findings.

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Acknowledgment

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In Vitro Sensitivity Of A Number Of Bacteria Isolated From Animals, To Terramycin*

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TERRAMYCIN is an antibiotic produced by an actinomycete, *Streptomyces rimosus*. The compound has been reported by Finlay, *et al.*,[1] to inhibit, *in vitro*, a number of microorganisms. Further tests were made on the *in vitro* activity of this antibiotic† against a number of pathogenic bacteria isolated from animals and the results are reported in this paper.

The organisms tested were *Corynebacterium renale, Corynebacterium pyogenes, Corynebacterium pseudotuberculosis, Corynebacterium equi,* certain unidentified diphtheroids, *Bacillus anthracis, Listeria monocytogenes, Erysipelothrix rhusiopathiae, Pasteurella multocida, Streptococcus agalactiae, Streptococcus uberis, Streptococcus pyogenes* (Lancefield Group A), *Streptococcus zooepidemicus* (Lancefield Group C), *Escherichia coli, Pseudomonas aeruginosa, Salmonella typhimurium,* and *Micrococcus pyogenes* variety *aureus* (*Staph. aureus*).

Materials and Methods

The organisms tested were grown for 18 hours in either extract broth, serum-enriched extract broth, or sterile skim milk. Inoculations were made by streaking a 4 mm. loopful of this culture on 5% cow blood agar plates to which terramycin had been added. The plates contained one, two, three, four, five, six, seven, eight, nine, ten, 25, 50, 75, 100, 150, 200, or 250 micrograms of the antibiotic per milliliter of blood agar, respectively. After inoculation, the test plates were incubated at 37 C. Examinations were made at the end of 24 and 48 hours, and the results were recorded as the minimum number of micrograms which completely inhibited the test organism. The results are given in table 1 and represent the bacteriostatic action of the antibiotic.

Eighteen hour cultures of stock strains of certain of the organisms were inoculated into sterile skimmed milk containing brom cresol purple and terramycin in various concentrations from one to 100 micrograms per milliliter. The mixtures were incubated at 37 C. for 48 hours and examined for characteristic changes indicating growth. Then a loopful of each mixture was streaked on the surface of a Difco blood agar plate and the plate incubated for 24 hours at 37 C. The smallest concentration of terramycin which resulted in the absence of colonies on subsequent plating was considered to be the minimum bactericidal concentration. The smallest concentration which prevented growth, as determined by the number of colonies on streak plating, was designated as the bacteriostatic concentration. Results are recorded in table 2.

TABLE 1. THE MINIMUM BACTERIOSTATIC CONCENTRATION OF TERRAMYCIN IN 5% COW BLOOD AGAR FOR VARIOUS BACTERIA ISOLATED FROM ANIMALS.

Bacteria Tested	Number of strains	Micrograms per ml. needed to inhibit the tests species for 24 hours	48 hours
C. renale	10	2-6	2-8
C. pyogenes	11	2-5	2-6
C. pseudotuberculosis	9	1-6	1-8
C. equi	9	75	100-250
Unidentified diptheroids	17	1-8	3-25
B. anthracis	3	1	1
L. monocytogenes	5	2-3	2-9
Ery. rhusiopathiae	8	1-3	3-4
P. multocida	5	1-2	1-4
Str. agalactiae	3	1	1
Str. uberis	5	1	1
Str. pyogenes (Group A)	3	1	1
Str. zooepidemicus (Group C)	2	1-2	7
E. coli	4	2	4-5
Ps. aeruginosa	2	50	100
Sal. typhimurium	2	1	4-9
M. pyogenes var. *aureus*	11	1	1-3

Discussion

E. coli, Sal. typhimurium, and most of the corynebacteria, with the exception of *C. equi* and some of the unidentified diphtheroids,

*Published with the approval of the Director of the Wisconsin Agricultural Experiment Station, Madison.

**Department of Veterinary Science, University of Wisconsin.

†Furnished by the Charles Pfizer Co., Brooklyn, N. Y.

were inhibited by moderately low concentrations of terramycin. *P. multocida, M. pyogenes* var. *aureus, B. anthracis, L. monocytogenes, Ery. rhusiopathiae,* and most of the streptococci tested, only grew in the presence of the antibiotic at very low concentrations. *Ps. aeruginosa, C. equi,* and some of the unidentified diphtheroids, were capable of growth in the presence of relatively high concentrations of terramycin.

TABLE 2. THE QUANTITIES OF TERRAMYCIN IN SKIMMED MILK NEEDED FOR BACTERIOSTATIC AND BACTERICIDAL ACTION OVER A PERIOD OF 48 HOURS.

Bacteria Tested	Number of strains	Micrograms per ml. Minimum bacteriostatic conc.	Micrograms per ml. Minimum bactericidal conc.
Str. agalactiae	2	1	1
Str. uberis	5	1	>100
Str. pyogenes (Group A)	1	1	1
Str. zooepidemicus (Group C)	1	2	5
	1	2	3
E. coli	1	5	>100
	3	7	>100
Ps. aeruginosa	2	100	>100
Sal. typhimurium	1	5	>100
P. multocida	1	7	>100
M. pyogenes var. *aureus*	3	1	1
	2	3	7
	1	3	>100

Terramycin had nearly the same bacteriostatic activity in skimmed milk that it did in blood agar. Most of the streptococci and some of the micrococci were killed by low concentrations. The gram-negative organisms *E. coli, Sal. typhimurium* and *P. multocida* were inhibited by low concentrations but not killed by 100 micrograms per milliliter, the largest concentration tested in skimmed milk.

These results demonstrate that terramycin has a broad spectrum of bacteriostatic activity *in vitro* against bacteria isolated from diseased animals. It merits *in vivo* trials on actual cases of specific infection providing that first it can be shown to be non-toxic to the animal species under treatment.

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▼ ▼ ▼

Streptomycin is found by one research group to be the best of eight antibiotics for treatment of the radiation produced by the atomic bomb. —*S.N.L.*

Cobalt in the Nutrition of Sheep

(*Author's Summary*)

An experiment was carried out with sheep in an attempt to learn more about the role of cobalt in the nutrition of ruminants. Every animal on the cobalt-deficient ration developed marked symptoms. All animals that received supplemental cobalt remained healthy. At the time of the first treatment, the cobalt-supplemented animals had gained approximately seven times as much in weight, were eating five times as much concentrates, six times as much hay, and were drinking twice as much water as the deficient animals. Wool production of these sheep was approximately 62% that of those receiving cobalt.

It was found that both cobalt sulfate and cobalt carbonate relieved the lack when administered orally. When injected intravenously, the former brought about a slow response if given daily or in large enough quantities twice a week. B-complex vitamins, liver extract, certain amino acids, a cobalt-free mineral mixture, fresh rumen liquid, and fresh raw milk were all without value in relieving the deficiency.—*Keener, et al., Jour. An. Sci.,* 9:404 (Aug.), 1950.

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Thymus Gland-Persistent or Overactive

(*Continued from page* 388)

these cases be treated by specialists in *x*-ray therapy, who have the necessary equipment to apply the desired amount of radiation. Each operator will be able to determine from experience and knowledge of his equipment, correct amounts to employ.

An incidental observation is that bitches which have whelped affected puppies may produce later litters presenting similar symptoms. Where possible it is advisable to treat all of such litters soon after birth. This method has been tried in a few cases, with apparent success, as subsequent litters have proved to be much more uniform in development, and capable of making faster gains in weight while evidencing a more healthy general appearance.

It is not intended to imply that persistent thymus glands in dogs will be seen daily or even weekly, but diagnosis is possible, and careful observation will reveal that the condition is not uncommon in these animals.

Passing The Stomach Tube Through The Nose In The Cat

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The problems of nasal passage of the stomach tube in the cat are very similar to those encountered in this procedure in the horse. Nasal passage of the tube removes it from the area which stimulates swallowing and, perhaps more important, from the area stimulating vomition. The small diameter of the tube decidedly limits the usefulness of this method. The stomach content would need to be in a very fluid state if this organ were to be emptied by a tube of the diameter that the nostril will accommodate. This method does offer an opportunity for introduction of drugs into the stomach and for feeding. Likewise, it may be useful in research on gastric secretion and its associated problems.

W. M. McLeod, D.V.M.

THE stomach tube may be applied in two different ways in veterinary medicine. It may be inserted through the mouth or by way of the nasal cavity. Form and dimensions of the modern instrument vary according to the way of passing the tube and size of the animal. The method of passing the stomach tube through the mouth is considerably older; in fact, the original method of stomach tubage. It was developed in an endeavor to make the alimentary tract directly accessible to local and general treatment; further, to avoid many difficulties which the veterinarian had to face at a time when the peroral application of medicines was the only method available in practice.

The disadvantages of the peroral method of passing the tube include the necessary use of some sort of speculum and the animal's restlessness and resistance. With carnivores, especially with cats, serious injuries in the mouth may be caused, such as smashing of jaws and palate, and breaking and knocking out of teeth.

As far as can be noted from the reports and works of the American authors, J. G. Horning,[1] J. M. Hurd,[2] and others, American veterinarians insert the tube in carnivores through the mouth without the use of a speculum. Jaws of the animal are opened by hand only as much as is necessary for passing the tube into the mouth between the incisors and pushing it further between the palate and the tongue down the pharynx. Doctor Horning, however, states that such tubage can be performed efficiently only with quiet animals, or if they are weak from illness. Fractious patients are better left alone, no matter how skillful the operator. Observations made at our clinic on the practical application of the above method prove that it is good, especially for dogs, because by it some of the mentioned troubles may be avoided. With cats, even this method has not solved the problem of passing the tube.

In an endeavor to avoid difficulties of the peroral entubage generally, the stomach tube which is passed through the mouth has gradually, during the first decade of this century, been supplanted in daily veterinary practice by the tube which is passed through the nose. This method having been developed by many experts, and the way having been found in which the position of the tube in the esophagus could be defined (the instrument in the meantime having to undergo many modifications), the nasal tube was generally accepted. Nowadays the nasal tube has an important place among the instruments of the rural practitioner, owing to its practical use and its many advantages in comparison with the peroral tube. The quiet behavior of the animal with the inserted nasal tube must be especially mentioned, and also the possibility of the tube remaining in the site for a considerable period, which enables determination of the right position and a quiet performance of the task.

In the available veterinary literature, there are no data concerning the employment of the pernasal tube in carnivores** particularly in cats. It is clear that there are daily opportunities in practice for employment of the stomach tube in these pets, because of frequent occur-

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**Except the dissertation by E. Maglajlic: Pernasalno davanje lijekova i sondiranje zeluca kod pasa. Zagreb, 1947, not yet published.

rences of diseases of the alimentary canal. In some diseases involving the mouth, entubage via this route is not at all possible. That is why examination was made of the possibility of the pernasal tubage and the application of medicine in cats, with regard to the possible advantages, and disadvantages, which may appear by the use of this method in practice.

Anatomical and Physiological Notes on the Nose and Pharnyx of the Cat

Before trying to insert the tube through the nose of the cat, the anatomical relations of the nasal cavity and the pharynx were investigated. This was done on a large number

Fig. 1. Cross section through the head showing the nasal tube in position.

of fresh anatomical preparations and roentgen photographs. Concerning physiological phenomena which the tube will come across on its way through the nose (reflexes of the fore air passage, respiration, swallowing) we have limited ourselves to clinical and roentgenoscopical observation of the phenomena accompanying the tubage.

The nose of the cat, compared with that of other domestic animals, is conspicuously short. The framework of the nasal cavity is made partly of bones, partly of cartilages. The majority of bones are facial bones. The ethmoid bone is the only one of the cranial bones which essentially contributes to the construction of the nose. The bony framework of the nose is completed by cartilages. The lamina perpendicularis of the ethmoid bone extends orally far into the nasal cavity, forming a great part of the nasal septum. The cartilaginous continuation of the lamina perpendicularis extends some distance orally of the tips of the nasal and premaxillary bones, forming the septum of the vestibulum nasi and external nose. From the dorsal and ventral edges of this projecting cartilaginous septum extend lateral cartilaginous wings, which form the characteristic shape of the nares. Skin of the external nose, which covers the nasal openings and the vestibulum nasi, continues aborally into the mucosa forming a number of ridges in the beginning of the nasal cavity. (Figure 1.) The most important of them, plica alaris, begins on the free edge of the dorsal cartilaginous wing, and rises upward to the nasal cavity, continuing caudad with the inferior nasal concha. More ventral is another ridge, which is supported by the ventral position of the cartilaginous ring. This broad and flat ridge is plica nasi ventralis. Beneath it is the beginning of the inferior passageway of the nose.

The superior nasal meatus begins with the middle nasal meatus and is separated from it by the superior nasal concha. The first extends just beneath the nasal bone and leads to the aboral parts of the ethmoid and the lamina cribrosa, where it ends blindly. The middle nasal meatus has almost disappeared in the cat. It is filled by the labyrinth of the ethmoid bone, which has protruded between the nasoturbinalis and maxilloturbinalia and thus divided the middle meatus into two narrow splits. The superior split leads to the nasoturbinalia and the greater part of the labyrinth. The inferior split joins further aborally the inferior nasal meatus. This later is relatively spacious.

The pharynx of the cat shows particular anatomical relations because of the mightily developed nasopharynx. This is an almost horizontally placed tube between and ventral to the perpendicular plates of the palatine bones and above the soft palate. The pharynx proper is caudoventral of the nasopharynx and it is rather smaller than the latter. The soft palate is very long and usually so situated that its final part and the free edge extend above the larynx, and do not lie beneath the epiglottis. In this manner the soft palate forms the bottom of the respiratory and roof of the digestory part of the pharynx.

Working Method and Acquired Experience

According to described anatomical relations of the nasal cavity of the cat, there is but a single way through which the tube of corresponding dimensions can pass. That is the inferior nasal passage. Since even this way is not particularly wide, only thin instruments may be used. As the nares are narrow and only slightly extensible, at the very beginning of the pernasal way, their cross dimension determines the diameter of the tube, which

can be inserted. Choice of the diameter of the tube is essentially determined by the breadth of the inferior nasal meatus on the spot where it is covered by the inferior nasal concha and the horizontal plate of the vomer and ethmoid. This is the narrowest spot on the whole route through which the tube has to pass. In this solid bony canal the instrument may occasionally stick.

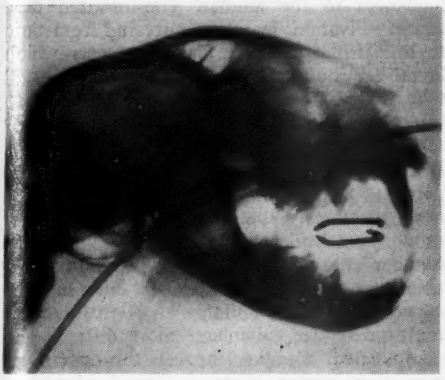

Fig. 2. X-ray of head and neck showing position of tube in relation to anatomical structures.

Two kinds of instruments are used as nasal tubes: (1) soft rubber tubes having a diameter of 2.5 mm. (Rüsch no. 8) and 3 mm. (Rüsch no. 12), length approximately 40 cm. with the full conic top and side aperture at the delivery end, and (2) elastic catheters of twisted silk, gummed, diameter 2 mm. and 3 mm., length 30 to 50 cm.

Procedure

Cats must be placed in a convenient position and firmly held so that the tube may be passed easily and quickly. From past experiments, it appears that the best way is to place the animal on its side on the table, where it should be held by an experienced assistant with one hand on the forelegs and the other on the hind legs. The head of the animal is held with one hand by the operator, while the tube is inserted into the nose with the other hand. It is best to seize the head sideways with the fingers over the forehead and the nape of the neck, pressing with the thumb the lower jaw towards the upper one. The head should be held fast and firmly. When the cat is prepared for passing the tube, the head of the animal is set in required posture, and the tip of the tube is inserted cautiously through the medial round part of the naris, ventrally and medially, in the direction of the nasal septum and the inferior nasal meatus. Correct direction is important so as to enter the inferior nasal passage. As soon as the tip of the tube touches the skin of the naris, or the mucosa, the animal gets uneasy. Most cats start sneezing, blow through the nose and toss the head, in an attempt to avoid the passing of the tube or to throw it out of the nose, and thus a strong and restless animal may present some difficulties. The tube, which is already inserted into the nose and directed ventrally and medially, will go of itself the right way if it is pushed further gradually at shorter or longer intervals. The animal is restless as long as the tube is being inserted, particularly as long as the tip of the tube passes through the

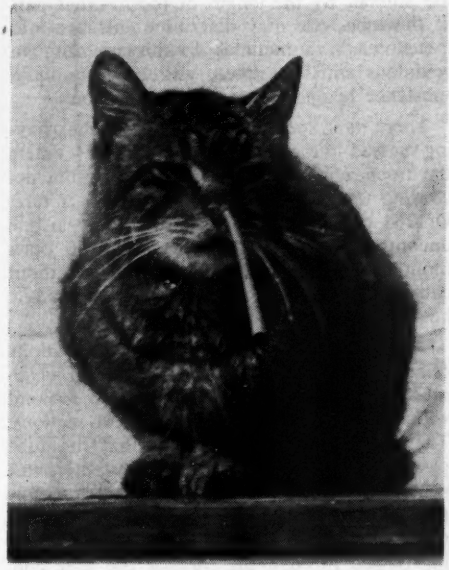

Fig. 3. Cats do not resist the nasal tube. It may be left in position for extended periods as desired.

nose. Considerable salivation accompanies the operation.

In most cats, tubes of about 2.5 mm. diameter can be inserted. It has been possible to insert rubber tubes of 3.5 mm. diameter only in some larger animals, chiefly males. Young cats are regularly an exception to the rule. One can insert relatively wider tubes in young cats than in adult animals in so far as the opening of the nares allows it. In old cats with completely developed and ossified labyrinth, one frequently does not succeed in inserting the tube corresponding to the size of the animal, to the dimensions of the head and to the width of the nares. The phenomenon is based, as is proved by examining the anatomical relations, on the fact that the bony and cartilaginous

parts of the nose in young animals are more flexible, so that they may be pushed back, whereas this is not possible in old cats with ossified and rigid nasal conchae.

As the tube enters the pharynx, the irritation does not cause the animal to swallow. However, the passing continues undisturbed and the tube enters the esophagus imperceptibly and easily. The hand does not feel any difference of resistance,* which does not vary even when the tube does not enter the esophagus but is reflexed and becomes fast in the pharynx. Further passing of the tube through the esophagus goes on easily and smoothly without any particular reaction on the part of the animal. By the length of the inserted part of the tube, one may determine entrance into the stomach. Sometimes in this moment an acidulous smell is noted, and often a liquid substance begins to drop from the tube.

There is a possibility that the tube, having passed the pharynx, deviates, *i.e.*, enters the trachea instead of the esophagus, but according to observations this possibility is rare. Of 264 cases of passing the tube, only in one uncontrollable animal, which cried with open mouth, the tube entered the trachea without causing the animal to either cough or breathe heavily.

A great number of *x*-ray examinations (figure 2) and photographs of animals in which tube has been passed, completely correspond with the findings of the anatomical sections. They strengthen the statement that the tube passes through the nose always by the same route. What happens in the pharynx while the tube is being passed has been proved by observations on roentgen screen. After having passed through the choana, the tube continues its way beneath the base of the skull, next to the dorsocaudal wall of the pharynx. Its tip touches the pharynx wall on the spot where the dorsocaudal wall of the pharynx bends ventrally. In most animals, who do not swallow the tube, the relations in the pharynx do not vary essentially. The tube bends in a slight arch ventrally and enters the esophagus smoothly. A smaller number of animals swallow the tube in the moment when it touches the dorsal wall of the pharynx. As an exception it may happen that the tube descending close to the dorsal pharynx wall does not enter the esophagus. In this case, its tip bends ventrally and touches the base of the epiglottis. If so, the animal regularly swallows, by which the tube is straightened and enters the esophagus.

When the passing of the tube is finished or when it no longer glides over the nasal mucosa, most animals quiet down and the tube may be left in the nose for an extended period. (Figure 3). Thus, in order to administer medicine, to get stomach juice, or to lavage the stomach, the tube remains in the nose for 15 to 30 minutes, or even several hours, without any consequences to the animal. The inserted tube causes salivation, tears and sneezing from time to time in some cats. There are cats which breathe through the mouth with the inserted tube. There are only a few animals that try to throw the tube out of the nose by spitting or tossing or even pulling it out with their paws. It can be said generally that cats endure the pernasal passing of the tube well, with the usual reactions. Quiet and sick animals do not show any considerable reactions. For a smaller number of animals which are by nature irritable, restless or fractious, difficulties may be experienced. Such animals are fiercely reluctant and render the tubage more difficult and complicated. Bleeding through the nose is no rare consequence in these. This is, however, not dangerous and soon stops of itself. Injuries of the nasal conchae are likewise harmless and pass generally without consequences. Even in those cats which have been tubed repeatedly for several days or many times a day, no inflammatory reaction has been noticed.

The quiet behavior of the animal with the tube in its nose makes it possible to determine exactly the position of the tube and to attain the purpose without haste. The inserted tube may be felt in the esophagus from the outside. It is most convenient to grasp the trachea over the lower edge of the neck in its middle third, with the thumb at one side and with the forefinger and middle finger at the other. The region above the trachea should be palpated up to the cervical vertebrae, touching with the fingers as deeply as possible. Under the palpation, the tube is felt as a strong flexible tube which escapes from the fingers. The throat should be grasped gently. If the palpation is harsh, most animals strain the muscles of the neck convulsively and render the palpation more difficult.

Many liquid medicines may be administered via the nasal tube. It may be employed for gavage (artificial feeding) when the animal cannot take food naturally. Because of the relatively small diameter of the tube, which can be inserted, the application of medicine generally lasts somewhat longer than through

(*Continued on page* 412)

*From the moment when the tube enters the nasal cavity until it enters the stomach, the resistance of passing the tube on the whole does not vary.

Blood Sedimentation Rate In Egyptian Buffaloes

HUSSIEN REDA,* M.V.Sc., Cairo, Egypt

SEDIMENTATION rate or suspension stability of blood is an important test in physiology, clinical pathology and gynecology, as well as an aid in diagnosis and prognosis. It indicates the course of disease and efficacy of treatment, the convalescent period, and optimum time for operation.

Literature

The suspension stability of erythrocytes in blood was first observed in the second century by Galen[1] with the formation of "crusta phlogistica." Hewson and Hunter[2] noticed rapid settling of corpuscles and attributed it to inflammation. Fahraues[3] used the test in the diagnosis of pregnancy in women. Hasselhorst stated that sedimentation rate is increased in infectious diseases and surgical inflammation. Polak and Mazzola[4] gave graphic representations of their findings in the relative value of sedimentation rate, leukocytic count, and temperature in groups of cases. Bochner and Wassing[5] declared that sedimentation rate is more sensitive and indicative than leukocytic count and temperature. Knowles[6] stated that an increase in the fibrinogen and globulin fractions of plasma protein is responsible for the clumping of cells and their more rapid rate of sedimentation.

Material and Method

The animals subjected to this work were Egyptian buffaloes of varying ages from two weeks to five years, and from both sexes. The animals were furnished by the animal breeding and animal feeding sections of the Faculty of Agriculture. The work was carried out on healthy animals which were free from parasitic infection, skin diseases and other specific disease. They were given a well balanced ration and were living under such circumstances as others in villages.

Blood samples were taken from the jugular vein. The syringe contained the proper amount of anticoagulant. The Westergren method was followed in this work. Blood was drawn up into a standard Westergren tube and left for two hours. The level of the r.b.c. column was read at the end of one hour and two hours. The distance sedimented in millimeters was recorded.

Results

On examining ten sucklings, one to 30 days of age, the sedimentation rate was less than that of average, normal adult buffaloes. It was about 15 mm./hr.

On examining ten buffalo calves, one to six months of age, the sedimentation rate increased with age, gradually to 40 mm./hr.

Sedimentation rate in 15 young buffaloes, six to 24 months of age, was decreased gradually. Average was about 35 mm./hr.

Sedimentation rate in 15 adults, two to five years of age fluctuated between 20 mm./hr. and 40 mm./hr. with an average normal rate of 30 mm./hr.

The sedimentation rate in females, however, showed a little rise as it generally attained about 35 mm./hr. in adult animals.

SUMMARY OF AVERAGE SEDIMENTATION RATE

Animal Groups	Age	Avg. Sedimentation Rate Time in Minutes			
		30	60	90	120
Sucklings	1-30 da.	5	15	18	20
Buffalo calves	1 - 6 mo.	15	40	48	60
Young buffaloes	6 - 24 mo.	12	35	45	56
Adult buffaloes	2 - 5 yr.	10	30	42	50

Hamed Nasr El Khamy stated that sedimentation rate in adult Egyptian buffaloes was about 40 mm./hr.

These observations are exactly concordant with the sedimentation rate in human beings. Fahraues[3] stated that sedimentation rate is 0.5 mm./hr. in newborn children, 7 mm./hr. in children at two years, 6 mm./hr. at six years, 3 mm./hr. in adult men and 7 mm./hr. in women.

It is indicated that serum albumin in the blood of the newborn child is high as compared with serum globulin or fibrinogen. These two proteins make their appearance in embryonic development much later than albumin. The decrease in sedimentation rate in newborn animals has been attributed to this decrease of serum globulin and fibrinogen and increase of albumin. Another cause of decreased rate in newborn is the increase of the number of erythrocytes. Plant theorized that the increased

*Lecturer in Veterinary Medicine, Faculty of Agriculture, Fouad I University, Giza, Egypt.

number of erythrocytes increases friction and decreases sedimentation rate.

Five pregnant buffaloes were also tested at monthly intervals during pregnancy and the results obtained indicated that the sedimentation rate was somewhat increased, but the fluctuations were within borders of the non-pregnant animals. Some pregnant females showed slight rise in the sedimentation rate, while others were within normal range. The sedimentation rate fluctuated between 5 mm./hr. to 15 mm./hr. with an average rate of 10 mm./hr. over the normal rate of the non-pregnant. Therefore, sedimentation rate cannot be utilized as a diagnostic test of pregnancy.

Friedlander stated that sedimentation rate applied on pregnant women gives no practical results from which it can be utilized as a test for the diagnosis of pregnancy before the fourth month. Starlinger and Samson stated that increased sedimentation rate in some cases is due to an increase in the fibrinogen content of the plasma. Wohlisch and Bohner found that increased rate during pregnancy is due to the presence of fine elastic threads of fibrinogen which adhere to the erythrocytes causing larger clumps of rouleau which, in turn, cause rapid sedimentation rate.

Conclusions

1. In sucklings, the sedimentation rate was less than the average normal rate of adults.
2. In buffalo calves, the sedimentation rate gradually increased to 40 mm./hr.
3. Young animals gave an average rate of 35 mm./hr.
4. Adult buffaloes gave an average rate of 30 mm./hr.
5. Females showed a little rise in rate.
6. Sedimentation rate cannot be utilized as a test for the diagnosis of pregnancy.

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Meat tenderness increases from three to 15 days after slaughter, according to a recent study.—*S.N.L.*

▼ ▼ ▼

Brucellosis has been transmitted to cows by artificial insemination using semen from naturally infected bulls.—*C. A. Manthei, D.V.M.*

Symptoms of Cobalt Deficiency

Cattle and sheep are the only species thus far known to be susceptible to cobalt deficiency. A large number of names have been given the disease processes resulting from inadequate intake of this essential inorganic element, which include coast disease, enzootic marasmus, bush sickness, pining disease and salt sickness.

Commonly reported symptoms of cobalt deficiency are listlessness, dullness, and, frequently, lacrimation, dull hair coat, inappetence, stunted growth or loss of weight, generalized weakness, and anemia. Affected animals waste away and die. Clearly, this is a general, rather than a specific, syndrome of malnutrition. Wool growth is markedly affected in sheep, conception in cows is difficult, abortions may occur, and lactation is depressed. All of these effects are to be expected in general malnutrition, and thus cannot be considered as specific or as directly related to cobalt deficiency.

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Passing the Stomach Tube Through The Nose in the Cat

(*Continued from page* 410)

the mouth. This applies especially to oils and viscous suspensions.

By means of the nasal tube, one may perform lavage of the stomach. For this purpose, one or two tubes may be passed into the stomach. In the latter case, it is best to insert through one nasal opening the thinner rubber tube, and through the other nasal opening, the thicker one. Both tubes may remain inserted. Meanwhile the animal breathes through the mouth. The thinner tube serves for injection of water into the stomach, and the thicker one for extraction of stomach contents by means of a syringe. They may be performed simultaneously, or the water is injected first and then the liquid extracted.

The lavage may be accelerated by raising the hind part of the animal, with light pressure on the epigastric region. However, the lavage of the stomach may be performed pernasally only when the stomach content is not too thick, so that it may pass through the narrow nasal tube. The importance of the nasal tube for lavage of the stomach in cats is of limited value.

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A.V.M.A. Florida Meeting

FLORIDA veterinarians, hosts to the 87th annual convention of the American Veterinary Medical Association, planned literary and social events that made the visit to Miami Beach a memorable occasion. Arrangement of the program, whereby sessions were shortened to allow visitors to take advantage of the facilities this vacation land offers, set a precedent that pleased. In addition, it allowed opportunity for meetings of study and social groups, a golf tournament, boat trip over the inland waterways, and fishing or surf bathing for those interested in these activities.

On every hand evidence was apparent of the forward drive of the veterinary profession in

Dr. C. P. Zepp, Sr., retiring President

the Southeast. Those who were able to take advantage of opportunities to visit both institutions in the south for training veterinarians and private facilities of practitioners were impressed by the excellence of equipment and advanced and modern practices employed. The School of Veterinary Medicine at Alabama Polytechnic Institute at Auburn, University of Georgia at Athens, and the Tuskegee Institute have enjoyed phenomenal growth during recent years. New buildings and equipment at these schools indicate thoughtful planning for a promising future for the profession and the livestock industry of the region. Hospitals for the care of small animals in metropolitan areas and animal clinics also reflect much credit to the profession as well as to the directors of these institutions.

Approximately 1,750 registered for the meeting, which included a sizable delegation of

Dr. W. M. Coffee, President

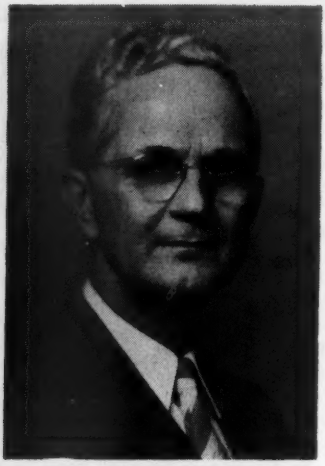
Cuban veterinarians. Attendence was not as large as at some previous conventions held in centrally located cities. The general session and sectional meetings were well attended.

Enthusiastic praise was expressed of the evident care in scheduling events and the rigid adherence to the planned program.

In his opening address before the general session, Dr. C. P. Zepp, Sr., retiring president, spoke of the role of veterinarians in assuring the continued advancement of America's military potential. Adequate supply of quality food of animal sources will add material assistance in keeping the nation strong. Veterinarians as practitioners must be alert to the threat of disease or any aggressive force that might affect the supply and safety of meat, milk, eggs, and other animal food products. Doctor Zepp also pointed out the public health service duty of the profession in safeguarding man from communicable diseases. He warned that socialization of medicine and agriculture would bring practicing veterinarians under bureaucratic controls, the effect of which would be a lowering of the present high quality of veterinary medical service available to livestock growers.

New Officers of the A.V.M.A.

Officers to serve the Association for the ensuing year were installed at the concluding session of the convention on Thursday morning, August 24. Dr. W. M. Coffee, practitioner, La Center, Ky., assumed his duties as president. Dr. John R. Wells, practitioner of West Palm Beach, Fla., was named president-elect.



Dr. John R. Wells, President-elect

Other officers elected include the following vice-presidents: Dr. Howard F. Fleming, Louisville, Ky.; Dr. J. A. Campbell, Toronto, Ontario, Canada; Dr. Niel W. Pieper, Middletown, Conn.; Dr. Angel M. Morales, Havana, Cuba; and Dr. W. T. Hardy, Sonora, Texas. Dr. W. A. Young of Chicago, Ill., was re-elected treasurer.

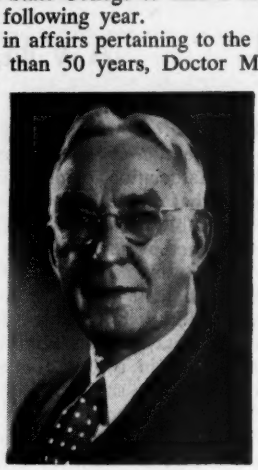
Awards

International Veterinary Congress Prize

The Twelfth International Veterinary Congress prize, consisting of a certificate and a cash award in the amount of the annual interest on special fund no. 2, was presented this year to Dr. Nelson S. Mayo, Highland Park, Ill., for his pioneering efforts to place veterinary education on a par with standard in the field of human medicine. Also cited was his leadership in furthering friendly, cooperative relations with the profession in Latin-America.

Doctor Mayo was graduated from Michigan State College in 1888, and received his veterinary degree from the now extinct Chicago Veterinary College in 1889. He returned to Michigan State College to earn a master's degree the following year.

Active in affairs pertaining to the profession for more than 50 years, Doctor Mayo twice



Dr. Nelson S. Mayo

served as secretary of the A.V.M.A. (1913-1915 and 1918-1922), had a key role in establishing the journal, was active in military affairs, and tirelessly worked for the advancement of the profession. The movement to require a six-year course for veterinary medical students now required was launched while he was chairman of the Committee on Education.

A.V.M.A. Award

Dr. Louis A. Merillat, 82, Chicago, Ill., was awarded the American Veterinary Medical As-

Dr. Louis A. Merillat

sociation award for 57 years of meritorious service to his profession. In presenting the gold medal and certificate, constituting the award, in recognition of his distinguished service, Doctor Merillat was lauded as an inspiring personality in the progress of veterinary medicine.

His long career as a successful practitioner in Chicago before the turn of the century and his activity as a teacher, professional leader, soldier, author and editor are well known. Doctor Merillat served as president of the A.V.M.A. in 1924-25 and as secretary in 1916-17 and as executive secretary in 1939-40.

He now holds the position of editor-in-chief of the *Journal of the American Veterinary Medical Association,* which he accepted in 1939.

Borden Award and Medal

In recognition of his work in developing a useful treatment regimen for calf diphtheria, Dr. James Farquharson, Head, Surgery and

Dr. James Farquharson

Clinics, Division of Veterinary Medicine, Colorado A. & M. College, Fort Collins, was cited by the A.V.M.A. Committee on Awards and presented the Borden award; a gold medal and $1,000 in cash. In addition, Doctor Farquharson's pioneer research into other diseases of cattle, including postparturient hemaglobinuria and actinobacillosis have won him international respect and are proving to be valuable scientific contributions.

A native of Aberdeenshire, Scotland, Doctor Farquharson, 53, is an alumnus of the Colorado school. His surgical demonstrations by means of colored motion pictures are perhaps the best known of his work. He has appeared on many scientific programs both in this country and England discussing, frequently as a running commentary to films, various surgical procedures.

Humane Act Award

Eleanor Mederak, 15, of Hamilton, Ontario, Canada, was the recipient of the 1950 Humane Act Award for her continuous and unselfish love for animals as demonstrated by repeated acts of kindness.

The selection of this Canadian girl from nominations received by the special Committee on Humane Act Award, headed by Dr. R. J. Garbutt, as set forth in the citation, was because of her ceaseless activity in rescuing injured animals and birds, befriending stray pets and finding homes where they may receive care.

One befriended bird, a pigeon, has refused the freedom offered after recovering from a broken wing. As a household pet, the pigeon amuses itself by chasing the family's cats, dogs, and two ducks, age 10 and 13 years.

A service scroll was presented to Doctor Zepp, retiring president, and a gold key to Doctor Coffee, by Dr. W. G. Brock at the opening session.

Entertainment

Extraordinarily pleasurable might express the entertainment features that included activities for all, arranged by the local committee. Components of the entertainment program included an Aqua Fiesta and Dance, in the exotic semi-tropical gardens of the famed Roney Plaza Hotel, special afternoon and evening parties for teen-agers, ladies' luncheons, excursions on the inland waterways in the vicinity already mentioned, and culminating in the President's Reception and Dance held on Thursday evening at the auditorium. In addition, visitors took advantage of opportunities for deep sea fishing and surf sunning and bathing at beaches and cabanas of hotels that offered unequalled facilities and service for comfort and relaxation.

Section on Small Animals

Featured in both of two sessions of the section on small animals were five-minute talks on fixed clinical questions. These discussions, in which a large group of authorities presented views, proved popular. Subjects were grouped and included a panel on canine distemper, heartworm infection and two sessions on clinical aids.

Both sessions were preceded by demonstrations arranged by members of the South Florida Veterinary Society including *x*-ray and laboratory technic, oxygen therapy, anesthesia, and blood transfusion. A display of *x*-ray plates illustrated results of treatment and surgery on patients of local practitioners.

Veterinary Public Health Board

The American Board of Veterinary Public Health held its annual meeting on August 21, 1950 at Miami Beach, Fla., during the A.V.M.A. convention. The group formulated plans and elected officers.

This board was incorporated under the laws of the District of Columbia on February 3, 1950, as a non-profit educational organization. The purposes of the Board are: (1) to further the educational and scientific progress in the specialty of veterinary public health and to encourage education, training and research in that specialty; (2) to establish standards of training and experience for qualification of specialists in veterinary public health; and (3) to further the recognition of such qualified specialists by suitable certification and other means.

The following definition was adopted by the Board: Veterinary public health is all community efforts influencing and influenced by the veterinary medical arts and sciences applied to the prevention of disease, protection of life, and promotion of the well-being and efficiency of man.

Officers elected by the Board are: Lt. Col. Frank A. Todd, U.S. Army Veterinary Corps, president; Dr. H. J. Stafseth, Professor and Head of the Department of Bacteriology and Public Health, School of Veterinary Medicine, Michigan State College, vice-president; Dr. Benjamin D. Blood, Chief of the Veterinary Public Health Section, Pan American Sanitary Bureau, secretary; and Dr. Martin D. Baum, Director of Veterinary Public Health, Colorado State Health Department.

Correspondence should be addressed to the secretary at 6315 Utah Avenue, N.W., Washington 15, D. C.

Turkey Disease Problems

Notes taken from an address by W. A. Boney, Jr., B.S., D.V.M., M.S., College Station, Texas.

Management factors, such as concern provision of adequate light, abrupt change of water fountains, feed troughs, and other similar faulty practices of beginners in turkey production, are largely responsible for poor returns for turkey growers.

Fowl typhoid in turkeys is considered a serious threat to the industry. Acute outbreaks of the egg-transmitted disease can be curbed by sulfaquinoxaline, the use of which will hold mortality to a minimum. This recommended therapy will give owners of infected flocks a chance to market all birds, clean up premises and restock.

Mineral Supplements and Their Use

Notes taken from an address by R. B. Becker, M.S., Ph.D., Florida Agricultural Experiment Station, Gainesville.

Livestock restricted to the forages on any fenced pasture reflect nutritive value of these forages and fertility of the soil, in their performance and physical condition. Soils adequate in mineral elements are most favored. These are alluvial, glaciated, residual, or windborne soils, of widely mixed origin. Such soils are relatively young, geologicaly speaking, or have not had their fertility leached by excessive rainfall and run-off. On the other hand, soils of extreme antiquity and young soils of unmixed origin, frequently are unbalanced in the minerals essential in agriculture. Plants and animals suffer on these less favored soils.

Mineral matter comprises a minor fraction of total nutrient requirements by livestock, yet it serves structural and functional uses in the body. Every cell, all body fluids, automatic heart beat, respiration, nerve tone, multiplication of red cells, such vital activities depend upon direct participation of one or more mineral elements. Although measured in small percentages, down to parts per ten million, need of any essential element is emphasized when it reaches a point of submarginal intake.

The mineral matter supply traces to soil, water, kinds of feed, and feeding practices. These bear scrutiny when shortage is suspected. Fertilizer applications may reduce severity of a condition, and use of proper mineral supplement overcomes it.

Since feed sources vary in mineral element contents with stage of growth of forage plants and since body functions differ during a lifetime, requirements for the several mineral elements vary seasonally with relation to growth, fattening, reproduction and lactation.

Elements sometimes lacking in different regions include common salt, iodine, calcium, phosphorus, iron, copper, and cobalt. Manganese shortage occurs in perosis, and some times with winter litters of pigs in the Corn Belt. Magnesium may be lacking temporarily in grass tetany.

Salt is the oldest known essential mineral, sought by herbivora and man from earliest time. Christ inferred need of salt by an analogy in the Sermon on the Mount. Dr. S. M. Babcock of Wisconsin, demonstrated that chlorine was the element in salt lacking under farm conditions. Yet excesses of salt occur along the sea coast, in salt basins, and in some deep-water sources. From experience, 1% of common salt is added to mixed concentrates for

cattle in most regions and less for swine and poultry.

Calcium is the second major mineral nutrient, essential for growth, milk and egg production, and in the feed lot with roughages low in calcium and limited in amount. Studies with radioactive calcium have disclosed that calcium can appear in milk or egg shells within a short time after ingestion. Eighty per cent of the calcium in milk and 20% of that in egg shell appears to have been deposited in the body previous to being mobilized for this productive use. Phosphorus follows a similar route in so far as milk secretion is concerned, a single oral dose of the radioactive element being secreted in milk as long as 17 to 30 days after ingestion. From calf studies, its deposit in bone is known, from which earlier balance trials and analyses proved withdrawal in times of shortages.

Presence of excess fluorine makes some calcium and phosphorus compounds unsafe in the long run for nutritional use as shown by research of Bohstedt, Forbes, Huffman, Maynard, Phillips and others. Sources which contain more than one part of fluorine per 40 parts of the element phosphorus are definitely avoided. There is need for wider official recognition of a safe maximum standard, because fluorine accumulates to a harmful level in the skeleton, and economic losses occur well in advance of fluorine toxemia.

Three elements, iron, copper and cobalt, are involved in one or more phases of respiratory functions. Iron is the mineral element in oxygen-carrying hemoglobin of blood, red organs and other tissues. Elvehjem discovered that copper facilitated iron utilization in the body. Copper functions in some manner also with skin health and hair pigmentation. More recently, cobalt was found to function in the red bone marrow in synthesis of new red blood cells. It also stimulates appetite. From inorganic cobalt compounds in mere traces, rumen organisms synthesize vitamin B_{12} for the cow and sheep so the latter do not need this vitamin in their feed. In cobalt deficiency, animals will refuse feed to the point of voluntary starvation. Requirements for cobalt are extremely small, but are essential to all animal life.

Seasonal consumption of mineral supplements the intake from feed sources. Even heavy fertilization of pastures at the Range Cattle Station in Florida reduced consumption of minerals per animal about one-half, as compared with that on unfertilized pastures. The proportions of minerals in a mixed supplement that would be ideal for one region, might not adapt to situations in another region even within a state, hence no single recommendation can be given. Recommendations have been made by experiment stations in the several states, some even adapting these to general soil regions within an area.

Commercial feed laws set a maximum of 5% added minerals, but standard practice usually is for 1% each of salt, calcium carbonate and steamed bonemeal or its equivalent in a safe form of phosphorus.

Since the various factors affecting mineral requirements differ between animals at any one time, use of a three-compartment mineral box in this region is recommended. One compartment is to provide additional loose salt; one is for steamed bonemeal (with salt to prevent molding); and the third is for iron-copper-cobalt supplement. Iodized salt is needed only on the older geological soil areas.

A few harmful excesses occur. Iodine can be overdone in medication. Lead paint and arsenical poisons sometimes cause deaths through accident. Selenium is a regional soil problem. On some muck lands, including parts of the Everglades, excess molybdenum is concentrated in certain plants and can cause excessive scouring, which can be offset by limited copper sulfate treatment.

Minerals are but a minor part of feed requirements, and their use is recommended mainly when local situations indicate their need. The use of specific mineral supplements is encouraged rather than prescribing a standard supplement.

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Advance Plans for 1951

Basic plans for the 1951 convention, scheduled for late summer in Milwaukee, Wis., already are in the course of preparation. During sessions at Miami Beach, visitors were asked to express their wishes by filling out the questionnaire card, made available, contents of which was as follows:

The Program Committee and Doctor Coffee would appreciate your answers to the following questions:

1. What do you like about this program?
2. What don't you like about this program?
3. What would you like to have included in the next program?
4. Who would you suggest to be on the next program?
5. Do you have any general ideas for the next program?
6. Do you have any specific ideas for the next program?

Free Fatty Acid in Blood in Ketosis

Notes taken from an address by A. H. Craige, Jr., V.M.D., College Park, Md.

Studies to determine free fatty acids (FFA) in the blood of normal cows have set a tentative standard expressed in milliequivalents. It was observed that FFA began to rise several days prior to parturition and reached a maximum within three days postparturition, then fell to physiological normals.

In cows that develop symptoms of ketosis, serum FFA remained high until symptoms were relieved. In cases of milk fever, FFA levels were comparable to those in uncomplicated parturition. Examinations of serum FFA and calcium, before and after calving, suggest the possibility that an interrelation between these elements may explain some pathological features of acute hypocalcemia of milk fever.

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Impaired Fertility in Beef Cattle

Notes taken from an address by G. T. Easley, B.S., A.M., D.V.M., Sulphur, Oklahoma.

Selective breeding of cattle for rapid weight gains has essentially been selection of animals having decreased thyroid activity. The influence of resultant hypothyroidism on reproduction has, in the work of the speaker, considerable influence on conception rate. An excessive fat condition is known to impair circulation, to suppress normal endocrine function, and to limit normal movement of the reproductive organs.

Provision for exercise, particularly of bulls, and reduction in concentrates in rations to effect loss of fat condition in cows has been followed by favorable results in conception. Administration of thyroid preparations to supplement management practices may prove useful in the future.

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By resolution, the A.V.M.A. urged Congress to pass legislation that would require the armed forces to call up veterinarians without previous military service before ordering back to duty World War II veterans. According to the context of this, men who were deferred from military service during the recent war to enable them to continue their studies, and others that received training at government expense, should be ordered to active duty first and assigned only in the field of veterinary medicine or to related duties.

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Losses due to rabies among east Texas livestock cost ranchers $250,000. last year.—*K. S. Young, D.V.M.*

Miscellaneous Notes

Intravenous administration of antihistamines has proved useful in the treatment of equine laminitis.—*C. E. Dee, D.V.M.*

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The Division of Veterinary Medicine, United States Air Force, is staffed by veterinary officers whose duties include the prevention of spread of foreign livestock maladies that might be brought into this country by globe-circling planes.—*Col. Wayne O. Kester, U.S.A.F.*

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In consideration of the well established value of *x*-ray in diagnosis and therapy, too little attention is given the science of roentgenology in our veterinary schools and by veterinary practitioners.

—*Myron Thom, B.S., D.V.M.*

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In a study initiated to determine the livability of *Brucella suis* in swine carcasses, Purdue University workers found that organisms survived as long as 20 days in refrigerated tissue of infected hogs.

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Rabid foxes were chiefly responsible for the loss of approximately 360 cattle, horses and mules in one section of Georgia during an outbreak of rabies in 1949. Dogs did not play a large part in this outbreak because about 75% were protected by vaccination.—*R. B. Phillips, D.V.M.*

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The trend to the use of dual-purpose breeds of chickens for egg production and crossbred birds for broiler plants is expected to influence parasite problems. Certain strains of heavy breeds, and hybrid strains, tolerate greater levels of parasitic infection than others. —*A. C. Todd, M.S., Ph.D.*

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In broiler production areas, with attendant rapid turnover in poultry population, millions of chicks are imported into and raised under crowded conditions. Here opportunity for the spread of disease is ideal and severe losses have been suffered by growers due to pneumoencephalitis (Newcastle disease). Vaccination, according to some reports, has failed to control outbreaks and strict adherence to principles of good sanitation and judicious and careful use of vaccine are necessary precautions in order to reduce disastrous losses.—*Charles R. Davis, D.V.M., M.S.*

EDITORIAL COMMENTS

Tuberculosis in Cattle Declines

Although tuberculosis among cattle is gradually declining in the United States, continued effort is necessary to eradicate the disease completely, according to a statement made by Dr. B. T. Simms, Chief of the Bureau of Animal Industry.

The number of reactors to the tuberculin test in the United States during the 12-month period ending June 30, 1950, was 17,733 or 0.19% of the total cattle tested. This is practically the same percentage as has been found during the last two years but it is lower than during the war years, when it rose to 0.2%. Although all counties are well below the 0.5% mark, the minimum required for the so-called modified accredited status, Bureau officials feel that considerable testing will be required to maintain that position during the next few years. Evidence points to an increasing prevalence of tuberculosis in some areas.

The Bureau's meat inspection service is rendering a specific aid in the campaign by reporting cases of tuberculosis in cattle to enable state and Bureau officials to locate centers of infection promptly in areas where testing is not in progress. Cattle sent to slaughter are identified by recording the breed, age, weight, color markings, brands, ear-tag numbers, and other similar information. In one state, such information furnished to officials enabled them to locate 300 tuberculin reactors during a ten-month period.

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Halogeton, New Posionous Weed, Dangerous to Livestock

A new and potentially poisonous weed, known scientifically as *Halogeton glomeratus*, but commonly called halogeton, is causing concern among livestock men, particularly sheepmen, in the northwest section. The pest was first reported from Nevada in 1935 and since has spread to areas in Idaho, Utah, California, Wyoming, Montana and Oregon. New areas of infestation on range lands are being reported constantly, indicating that the boundaries are not yet established.

In some stages of its growth, halogeton has much the appearance of Russian thistle, or five-hook bassia. This similarity to a common plant of the region may explain its establishment in such an extensive area. Losses of sheep and cattle have been reported. Stomach contents of animals involved were found to be almost 100% halogeton. Chemical analysis of dried specimens of the plant where large losses of sheep had occurred, contained total oxalates equivalent to 10% anhydrous oxalic acid. When the plant is eaten, the oxalates draw calcium from the body to form calcium oxalate, to the point of calcium depletion of the animal's system. Symptoms resembling parturient paresis develop, followed by coma and death. No specific treatment has been found.

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Brucellosis Research Report

Abstracts of reports of progress in brucellosis research at the University of Wisconsin were presented at the 1950 post-graduate conference for veterinarians, June 20-21, at Madison.

Cattle vaccinated with strain 19 Brucella vaccine as young adults or as calves in 1946 were exposed to active infection during their third gestation period early this year. Revaccination at 14 or 20 months of age after vaccination at eight months did not, on the basis of results to date, appear to have altered the resistance to infection. Revaccination caused an earlier and higher response in agglutination activity of the blood serum, but the average was below the suspicious 1:25 value by the end of the second pregnancy.

The feeding of trace mineral mixtures, as advocated by certain commercial interests, has not had any beneficial effect whatsoever in raising resistance to infection.

Type of brucellosis among Wisconsin residents was shown to be of the bovine type in 90% of the cases. Brucellosis is more common in rural areas and among veterinarians and packing house workers, thus stressing the hazards of contact with infected animals.

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It is revealing, as well as interesting, to note (*Vet. Rec.*, 62:455, 1950) that the Ministry of Agriculture, Great Britain, is concerned over the increase in the number of confirmed cases of hog cholera there. By July 27, this calender year, 43 cases had been confirmed, 30 in England and 13 in Scotland. This is 38 more than for the entire year of 1949, and 11 more than in 1948.

European countries are ahead of the United States in research work on foot-and-mouth diseases, according to Dr. C. M. Duckworth, California Assistant State Director of Agriculture and Dr. Jacob Traum, Professor of Vetererinary Science, University of California, who have recently returned from a three-month trip as observers of animal disease conditions in Europe for the California legislature. The Netherlands are rated as doing the most effective job in the development and use of vaccine. In most European countries, officials and veterinarians are alert to the fact that foot-and-mouth disease constantly threatens their food supply. Suppression crews are maintained there which respond like fire departments whenever a new outbreak is recorded.

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Dr. Ernest S. Tierkel, Public Health Service veterinarian with headquarters in Atlanta, Ga., has been named to a five-year term on the World Health Organization's (WHO) expert panel on rabies.

Erratum

Readers are referred to the illustration accompanying the article, Occurrence of and Treatment for the Destruction of the African Blue Louse on Sheep in Northern Arizona, prepared by Dr. H. E. Kemper and Dr. W. M. Hindman, that appeared in the September issue of VETERINARY MEDICINE, page 359. Designation of the sex organs on the two lower drawings were reversed. The drawing on the right is the male, on the left the female.

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A.V.M.A. Research Council is seeking to arrange an exchange of graduate students with foreign schools of veterinary medicine.

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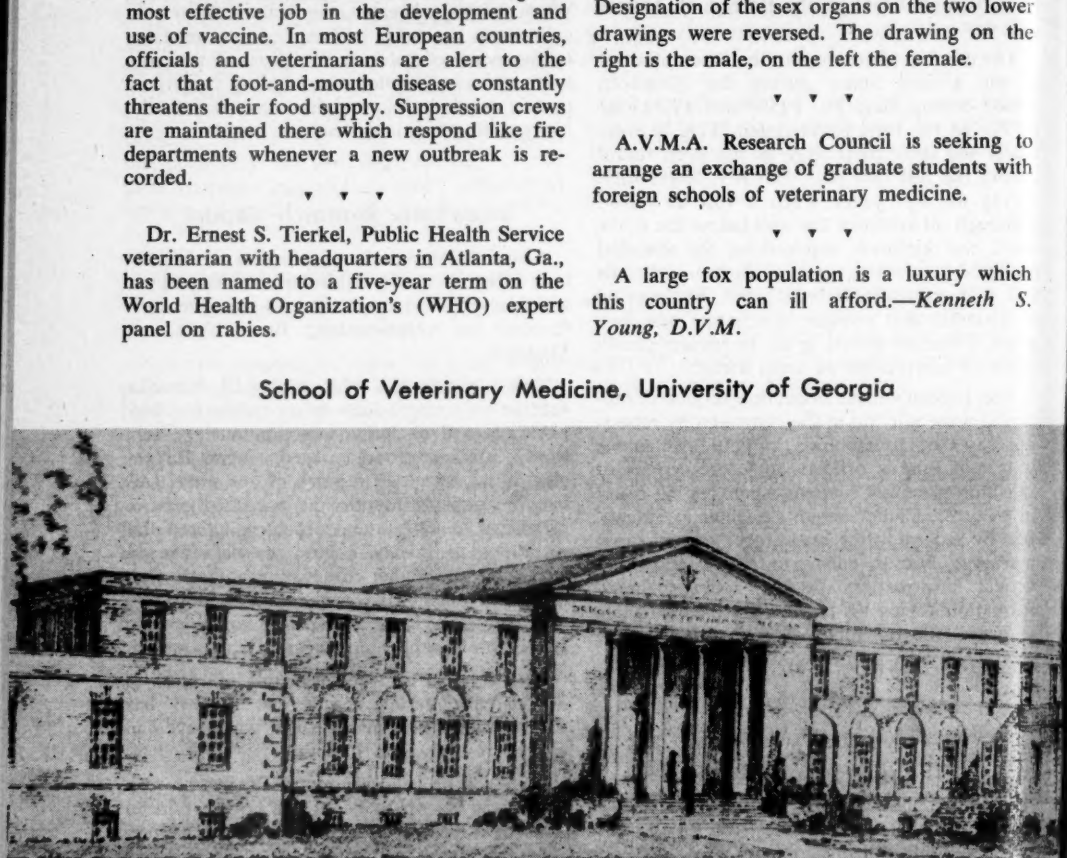
A large fox population is a luxury which this country can ill afford.—*Kenneth S. Young, D.V.M.*

School of Veterinary Medicine, University of Georgia



Virtually complete and ready for occupancy this fall, the magnificent new School of Veterinary Medicine, University of Georgia, Athens, of which Dr. Thomas J. Jones is dean, is the culmination of years of thoughtful planning by the officials of that institution. Housing, when complete, all departments of the veterinary school under one roof appears to have been a challenge successfully met. The spacious building, depicted above, all of which is not shown, embodies necessary elements for basic science study and for instruction in clinical medicine. Here is exemplification of the confidence held by members of the profession in Georgia and the Southeast in the future of veterinary medicine. These facilities are certain to make possible improvements in the present high standards of veterinary education at the Georgia school.

Anesthesia in Veterinary Medicine A Century Old

The current year completes a century since general anesthesia was first successfully employed in surgical operations on animals. That statement is based upon published records available to the writer. The possibility exists that anesthesia may have been employed in animals a few years earlier than 1850, but not reported. Such, however, is unlikely since reports in *The Veterinarian* of unsuccessful attempts to anesthetize horses with ether in 1847 imply that none succeeded in accomplishing a useful anesthesia in the horse with this agent in England. Had success been achieved elsewhere, it is probable that the editor would have appended a footnote to that effect.

Inhalation anesthesia in medicine began with ether and nitrous oxide, but made little headway among physicians for several years. In 1842, Dr. W. E. Clarke, a physician of Rochester, N. Y., employed ether anesthesia in the extraction of a tooth. Shortly thereafter Dr. C. W. Long, Jefferson, Ga., began to use ether secretly in surgical operations. In 1844, Horace Wells, a dentist of Hartford, Conn., began the routine use of nitrous oxide in extractions. Dr. W. T. P. Morton, who was familiar with Well's use of nitrous oxide, on the advice of a chemist, tried ether anesthesia in a tooth extraction. Being pleased with the result, he applied for and was accorded an opportunity to demonstrate ether anesthesia at the Massachusetts General Hospital. This was in 1846. The demonstration was a success, the results were published and attracted wide attention. In January of the following year, Prof. J. G. Simpson of Edinburgh, Scotland, advocated the employment of ether in childbirth, and started a resounding controversy that acquainted every European physician with the method.

During 1847, reports of several attempts of British veterinarians to anesthetize horses with ether were published in *The Veterinarian*. None was successful. These attempts were doomed to failure, not only because ether is not a suitable anesthetic for the horse, but inescapably because of faulty technic. Since ether was used in man as a substitute for restraint, it appears not to have occurred to veterinarians to restrain the animals in order to give them ether. The anesthetic was given by putting it into various types of muzzles on standing animals, or in some cases by inserting large wads of cotton soaked with ether into the nares. Considerable destruction of property, severe injury to the animals and not a little danger to attendants and onlookers, but no anesthesia, resulted from these practices. Other reports record experiments in which asses, a few dogs and two cats were anesthetized, and approximately an equal number of experiments in which failures were the outcome.

It seems more than strange that of perhaps 20 leading practitioners who told of their experiences it did not occur to any to prevent the disasters they described by restraining the animals. It is not more incredible, however, than reports of two professors who, according to their stories, merely offered the ether to horses which then followed them about the stable eagerly inhaling the fumes until the animals sank to the floor, profoundly anesthetized and were operated upon without restraint, after which they arose showing no effects of the ordeal.

During the same period, the results of similar experiments at the Veterinary College at Alfort, France, were essentially the same. Both in France and Britain encouraging results were reported from the use of ether in somewhat less than anesthetic amounts in the treatment of tetanus and one instance of a cure of rabies.

After 1847, no further reports of the use of ether for the induction of anesthesia were published, but Mayhew, the foremost experimenter with it as an anesthetic in 1847 published a long article in 1848 extolling its use in various gastrointestinal ailments when given orally or per rectum. In this article, he reminded readers that he had predicted the preceding year that ether would never prove useful for the alleviation of pain (in horses). He said subsequent experience confirmed the accuracy of his prediction.

At the end of November 1847, Dr. J. Y. Simpson, Professor of Midwifery in the University of Edinburgh, announced the discovery of the anesthetic properties of chloroform. The announcement aroused great interest in the medical profession and immediately led to much experimentation among veterinarians. A greater measure of success attended its use in horses than had been attained with ether, but the use of this agent remained in an experimental stage. However, it seems to have been employed to some extent for euthanasia in dogs. *The Veterinarian* for 1848, contains 13 discussions of the use of chloroform on animals and its effects. As with ether, the greatest drawback to its use in practice appears to have been the failure to cast or otherwise restrain the animals before administering the anesthetic.

The Veterinarian for 1849, contains no reference to the use of either chloroform or ether as anesthetic, but contains one report of the unsuccesful use of the latter in tetanus and one report of unsuccessful and two of successful treatments of this disease with chloroform.

A few cases were reported in 1850 in which horses were anesthetized for firing. These animals were cast before the inhalation of chloroform was commenced and no untoward results were mentioned. A dog also was anesthetized for removal of warts from the mouth. The feeble beginning of the use of anesthesia in veterinary medicine was at hand.

There is no record of what, if anything, was occurring in the employment of anesthesia in veterinary practice in North America during this period, for there was no veterinary periodical published in the United States nor in Canada until the *American Veterinary Journal* was established in Boston in 1851. In the second volume of that publication, George H. Dodd, V.S., reported (1852) an operation on a horse that was anesthetized with chloroform. The anesthesia was mentioned almost incidentally and no technic of administration nor other particulars were given. From this, one might surmise that the use of chloroform was not new to Dodd in 1852; however, that is speculation. —*D.M.C.*

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Bovine Brucellosis Reduced

Decline in the incidence of brucellosis in cattle is reported by the BAI. Percentage infection is given as 3.5% for the 12-month period ending June 30, 1950. This percentage is computed on the basis of 5,974,721 tests and indicates a reduction of 0.8% under that given for the previous year.

During the same period, more than 2,000,000 calves were vaccinated with strain 19 vaccine.

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County agents can do their consultants who are livestock owners a service by persuading them that the treatment of disease is a highly specialized science which can be best and most economically handled by a good veterinarian.—*Dean W. A. Hagan.*

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It is estimated that at least 35% of the meat consumed in this country receives inadequate sanitary inspection or no inspection at all.—*H. G. Bailey, D.V.M.*

Dr. H. O. Monnig on American Tour

Dr. H. O. Mönnig, B.A., Dr. Phil., B.V.Sc., general manager of Agricura Laboratoria, Bpk., Silverton, South Africa, formerly Professor of Parasitology, Faculty of Veterinary Science, University of Pretoria, and Veterinary Research Officer, Onderstepoort, S. A.,

Dr. H. O. Monnig

is making a rather extensive tour of the United States to observe veterinary practices and methods employed here. VETERINARY MEDICINE acknowledges the personal visit to its editorial offices of this authority well known to American veterinarians as the author of the popular textbook, Veterinary Helminthology and Entomology, the fourth edition of which is now in the course of preparation.

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Intense interest has focused on the cortisone treatment for arthritis since it was first announced at the Mayo Clinic over a year ago. Physicians have been handicapped by the limited supply of the drug, its prohitive high cost, and certain unfortunate side effects which develop incidental to the treatment, when large doses are used. Recent research has indicated that when insulin is given simultaneously with cortisone, smaller doses of the adrenal hormone may be effective. This method of administration also offers a means of avoiding dangerous side actions of the drug.

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The New Hampshire Breeding Association, farmers' cooperative, located at Concord and promoting artificial insemination of dairy cattle in New Hampshire and Vermont, now has 4,400 members, owning 35,000 cattle. During the first six months of the current fiscal year, 14,750 cows were inseminated.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

There is accumulating evidence that some of the antibiotics used for udder infection in the treatment of mastitis in dairy-cows, cause difficulties in the making of cottage cheese and cheddar cheese. Makers say that cheese cultures are completely killed. It is indicated that the milk of a cow that had received 200,000 units of penicillin, after an elapse of 12 hours, when mixed with 99 parts of milk from untreated cows caused difficulty in cheese making. A recommendation is to withhold from delivery to commercial sources and cheese factories the milk of treated cows until after the fifth milking following treatment. With this precaution, cheese-making difficulties are obviated.

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Carcinoma of the penis is of relatively common occurrence in man and domesticated animals. In man, clinical evidence seems to indicate that smegma and infections retained by a tightly adherent prepuce are important etiological factors in cancer development. Human males circumcised after a few days of extrauterine life are only rarely affected. The females of those groups in which the male is circumcised very seldom develop carcinoma of the cervix. Smegma of equine origin introduced into an artificial sheath in mice resulted in tumor formation though controls similarly implanted with cerumen (ear wax) were not affected. On the foregoing basis it would seem advisable to practice sheath sanitation in valuable animals.

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Brander, in the *Veterinary Record,* July 15, 1950, makes the following statements regarding the use of sodium fluoride in the treatment of ascariasis in pigs:

1. "The dose may be given as 1% of a dry meal fed to the pigs. In this method, the pigs are fed in even groups up to eight and are given the amount of dry meal that they would normally eat in a day."

2. "The dose may be given at the rate of 0.1 to 0.15 gm. commercial sodium fluoride per pound body weight (equivalent to 0.075 to 0.1 gm. technical sodium fluoride per pound body weight). If the drug is to be given in a wet mash, the minimum dose should be employed and the pigs must be weighed. It is not safe to depend on a pig-keeper's estimate of the weight of his pigs as even the most expert may be quite wrong in his guess. A weight variation of ten or 15 pounds can make quite a difference in the dose given."

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An old-timer question came to my desk a few days ago: "How can one distinguish between a front and a rear horseshoe?" In general, a shoe should follow the shape of the os pedis. The anterior sole is circular in its periphery, with the toe slightly raised, while the posterior has a more pointed outline and its sole is flat so that it rests evenly on a level surface. Therefore, a front shoe is circular in outline, it may or may not be slightly raised at the toe, and for a horse of regular conformation, there are six nail-holes, three on a side, placed in the anterior half of the shoe. A rear shoe is more pointed, or less circular, rests flatly on a surface, and has eight nail holes, four on a side, placed in the anterior two-thirds of the shoe. In neither the front nor rear shoes are there nail holes in the posterior one-half or one-third of the shoe, because nails into these portions of the foot will interfere with normal expansion and contraction; physiological movements, essential for the healthy foot.

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A western ranchman wrote for information about tapeworms in cattle. He had just read a newspaper report from Illinois about an infection of cattle with *Moniezia expansa* which were successfully eliminated following treatment with lead arsenate. In going through available current literature, occasional mention of use of this chemical in sheep was found, (see *Vet. Med.* 41:306 [Sept.], 1946 and 45:370 [Sept.], 1950) and only one reference to its use in cattle. The claims for it as a taeniacide were conservative. The recommended dosage of lead arsenate for calves up to three months of age is 0.5 gm. (7½ gr.); calves three to six months of age 1 gm. (15 gr.); and adult cattle 2 gm. (30 gr.). A full dose of castor oil one hour after the oral administration of the drug is recommended by some investigators.

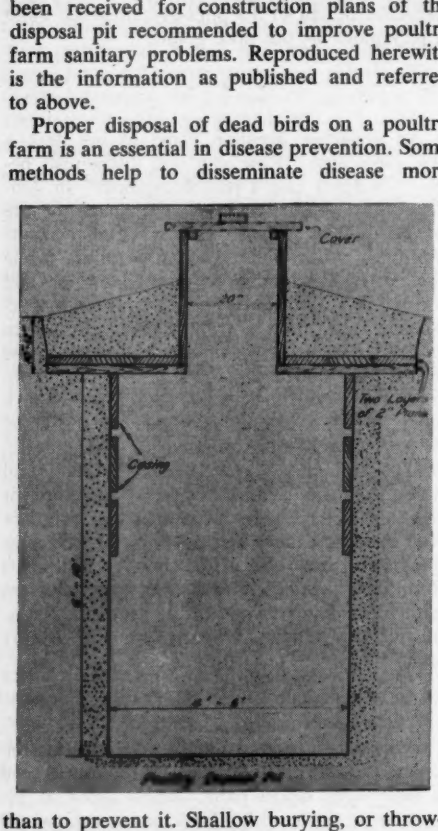
POULTRY PRACTICE PROBLEMS

W. R. HINSHAW, D.V.M., Ph.D.
Frederick, Maryland

Poultry Disposal Pit

Since its publication in VETERINARY MEDICINE for March 1948, many requests have been received for construction plans of the disposal pit recommended to improve poultry farm sanitary problems. Reproduced herewith is the information as published and referred to above.

Proper disposal of dead birds on a poultry farm is an essential in disease prevention. Some methods help to disseminate disease more than to prevent it. Shallow burying, or throwing birds on isolated fields, or into streams are examples that should not be followed. Feeding dead, uncooked birds to swine is a dangerous procedure, because some diseases, *e.g.*, tuberculosis and salmonellosis, may be transmitted to the swine. Furthermore, the swine may in turn transmit these diseases to other birds. Another reason for not feeding unsterilized dead birds to swine, is that the uneaten portions of the carcasses may be consumed by wild birds, rats, cats, or dogs, and these animals in turn, carry infection to poultry ranches.



Misuse of incinerators makes their employment questionable on most farms. Too many poultrymen pile their dead birds outside the incinerator until it is convenient to burn them. In the meantime, flies, rats, birds and other animals may do a good job of spreading disease to a neighboring flock.

A method which is growing in popularity is the use of a disposal pit such as shown in the accompanying illustration. Its simplicity and ease of operation, plus its effectiveness, explain its popularity. Such a pit can be located near the poultry buildings, and if properly constructed will not be at all objectionable. It should be located on an area which drains away from the water supply. The size depends on the needs of the flock owner. The usual procedure is to make the pit about six feet deep and four to six feet wide. It is important to have the top well covered and airtight. The size of the opening at the top depends on the use. On a chicken farm there is not the need for as large an opening as on a turkey farm. For turkeys it is desirable to have an 18 or 20 inch opening. The lid for the opening must be tight fitting and fly-proof.

One of the principal advantages of this disposal method is the ease with which the dead birds can be discarded. All one has to do is to remove the lid and drop the carcasses into the pit. A small amount of caustic lime spread over the birds occasionally will hasten decay. The pit may be used for incubator eggs and waste, but since eggs do not decay, such use shortens the life of a pit. The liberal use of DDT on the surface is advisable as a fly control measure, but if the pit is properly constructed and used, fly control will not be a problem.

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The survival of coccidia oocysts in the soil was studied by Koutz (*Speculum*, 3:3 [Spring], 1950) who has presented the following information: *Eimeria tenella* survived 272 days from September to June and were found infective to chicks after this period of exposure. When a mixture of *E. tenella, E. acervulina, E.mitis* and *E. maxima* was exposed through a severe winter and a partial summer for 322 days, all but *E. tenella* survived. In a third experiment, the same four species were exposed for one year under different sunlight exposures. Only *E. acervulina* and *E. mitis* survived, and both these species also died in grassless pens exposed to direct sunlight.

ABSTRACTS OF LITERATURE

Precautions in Using BHC as Sheep Dip

To prevent injuries to sheep being treated with insecticide dips containing gamma benzene hexachloride (lindane)[44] two precautions should be taken: (1) Keep the temperature of the dip at approximately 35 C. (95 F.). (2) Add a bactericide to the dip, *e.g.*, copper sulfate, 1:3,333. While otitis has often developed in dipped sheep, not a single case was observed among 2,276 sheep dipped in copper sulfate-containing BHC dips. Keeping the dip warm proved helpful since the optimal growth temperature of microorganisms causing otitis and related conditions is lower than that recomended for the dip.—*G.L.*

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Eperythrozoonosis in Swine

That icteroanemia or anaplasmosis-like disease in swine is the result of acute infection with *Eperythrozoon suis* has been shown by Splitter[45] in studies covering 35 parasitic attacks.

Experimental transmission of the infectious agent was accomplished in susceptible splenectomized pigs by intravenous injections of citrated blood from known carriers of this disease. Symptoms and postmortem lesions resemble those reported by several workers who have observed these blood cell parasites resembling those seen in anaplasmosis in cattle.

Eperythrozoon suis, according to the author, is a common blood parasite of swine. The majority of older animals are exposed and infected when young and probably remain immune carriers. Clinical cases usually are diagnosed in young susceptible swine which are exposed to infection from carriers, presumably by insect vectors. Intensity and duration of attack varies widely in herds and individuals. Normal healthy swine are able to suppress infection and make spontaneous recovery. Mild anemic infection is symptomless.

Significant are the results of blood examination of a pig recovered from natural infection. Repeated microscopy failed to reveal parasites over a two-month period. Acute manifestation of disease due to *E. suis* followed splenectomy. There is no conclusive evidence that acute, spontaneous relapses occur in unoperated animals.

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Experimental Feeding of Parathion to Cows

Parathion (O,O-diethyl, O,*p*-nitrophenyl thiophosphate) is in great demand as an insecticide against pests of some fruit and forage crops. Speculation on the residual effect of this agent and its presence in meat or milk of animals fed treated forage suggested the need of experimental determinations[47]. These were set up by feeding quantities of parathion to ten cows in various stages of lactation and making frequent analyses of milk during the course of the feeding experiment lasting 81 days.

At no time, nor in any of 250 separate samples analyzed, was any parathion found in the milk though quantities given exceeded possible dosage by feeding treated forage. No harmful effect was noted in the animals and no off flavors developed in the milk.

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The bacterial efficiency of quaternary ammonium compounds is affected markedly by the nature of the water in which the compound is used. The concentration of active agent required to produce a 100% kill in one minute of *Escherichia coli,* test organism, varied from 15 to 500 p.p.m. in work conducted by Butterfield, *et al.*[46].

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Experimental findings reported by Chang (*Sci.,* July 28, 1950) fail to support the claims made for the clinical use of hyaluronidase; its addition to sperm suspensions did not increase the number of fertilized ova.

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[44]Endrejat, E., Accidents after Bathing Sheep in Gamma Benzene Hexachloride-containing Solutions. *Tierärztl. Umschau,* 5:164, 1950.

[45]Splitter, Earl J., *Eperythrozoon suis,* the Etiologic Agent of Icteroanemia or an Anaplasmosis-like Disease in Swine. *Am. Jour. Vet. Res.,* 11:324 (July), 1950.

[46]Butterfield, C. T., Wattie, Elsie, and Chambers, C. W., Bactericidal Efficiency of Quaternary Ammonium Compounds. *Pub. Hlth. Repts.,* 65:1039 (Aug. 18), 1950.

[47]Dahm, Paul A., Fountaine, F. C., and Pankoskie, Joseph E., The Experimental Feeding of Parathion to Dairy Cows. *Sci.,* 112:254 (Sept. 1), 1950.

CLINICAL REPORTS

Abdominal Adhesions in the Dog*

HOWARD G. SENTER, D.V.M., Nashville, Tennessee

Veterinary literature contains little specific information on the occurrence of abdominal adhesions in any animal. Mention is made by some authors warning of the possibility of adhesions following faulty operative technic. Specific discussion is not found, yet their presence is noted in both antemortem and postmortem examinations by careful, experienced practitioners. They are often overlooked clinically. It is realized that an indefinite variety of symptoms could be manifested because of the many tissues or organs in the adbominal cavity that may be involved. Diagnosis is usually difficult unless one carefully evaluates the history and has opportunity for extended observations. In some cases, the presence of a fistulous tract will point directly to the existence of adhesions. In a large majority of cases, including those having fistulous tracts, adhesions can be satisfactorily corrected.

From an etiological viewpoint, abdominal adhesions as seen in the dog may be classified in two groups: operative (surgical); nonoperative (traumatic).

Operative causes may be:

(1) Prolonged exposure of adbominal tissues.
(2) Trauma from surgical instruments or rough manipulation.
(3) Hemorrhage and seepage.
(4) Improper ligature material or improper fixation.
(5) Introduction of foreign materials into the abdominal cavity, such as hair, cotton fibers, etc.

Nonoperative causes may be:

(1) External violence, as kicks or auto injuries.
(2) Penetration of foreign bodies from the exterior, as wild oat beards, shot, etc.
(3) Ingestion of foreign bodies.

Case Report

The following case presented February 3, 1950, at the Small Animal Clinic, Tuskegee Institute, School of Veterinary Medicine, well illustrates the unusual symptoms often present in the existence of adbominal adhesions.

The subject was a Beagle, female, three years of age, weight about 20 pounds, and in apparently good condition. This dog was the property of a naval officer and had accompanied the officer's family from one part of the country to the other.

The bitch whelped two litters of puppies by the time she was one and one-half years of age, and delivered normally in each instance. She was spayed soon after weaning the second litter and no difficulty concerning the operation or in the healing of the operative wound was reported to the owner. Shortly afterwards, (the owner was unable to state exactly how soon) the dog began to exhibit peculiar symptoms or actions associated with the act or rather the desire to urinate. She was uneasy, cried or whimpered, and hesitated before attempting the act of micturition. These symptoms were regular, always preceding the desire and act. After some months, a veterinarian was consulted, who dispensed some tablets which appeared to give the dog relief as long as they were given. The owner stated that at no time did the animal manifest dysuria or incontinence nor did the caliber of the urine stream appear smaller than normal. No evidence of blood was observed. Frequency of urination was increased and some retention was suspected.

Examination disclosed: temperature, 102.6; pulse, 98; respirations, 18 and general condition good. Tenderness was manifested on abdominal palpation, especially about the neck and body of the bladder. A metal catheter was introduced without difficulty and about 4 oz. of normal colored urine removed. No cystic calculi could be detected by catheter or by palpation. The bladder did not appear to contract or retract to its normal empty pelvic position as the catheter remained well forward. A tentative diagnosis of adhesions was made and the owner was requested to leave the dog for observation and for exploratory laparotomy if that was deemed advisable.

The animal was closely observed for four days and during that period two urinalyses, daily examinations and bladder radiographs were made. Urethritis, cystitis, urinary calculi, incontinence, retention with overflow were eliminated. It was also observed that at no time following urination, was the bladder found empty, more urine than normal being retained. It was also noticed that the scar from

*This report of a case was presented by the author as a senior veterinary student at the Tuskegee Institute, Tuskegee, Ala., and was awarded the second prize in the contest sponsored by VETERINARY MEDICINE (see *Vet. Med.*, 45:249 [June], 1950).

the previous laparotomy was unusually long causing suspicion that some difficulty may have been encountered in that operation.

On the fifth day of hospitalization, an exploratory laparotomy was performed. A large field was clipped, shaved and prepared; pentobarbital sodium anesthesia was given intravenously. A midline incision was made directly through the scar of the former incision and the omentum was found attached along the course of the abdominal wall scar. This adhesion was set free by blunt dissection and the incision continued to a length of about six or seven inches for full exposure. The entire bladder was found to be enclosed by and adhered to the omentum from the fundus to the posterior third of that organ. At this latter point, the omentum was firmly bound in a circular manner and at right angles to the long axis of the bladder. This adhesion gave the bladder an elongated shape in contrast to the normal ovoid and also served to hold the bladder forward in the abdomen, thus preventing normal contraction and retraction. Adhesions were broken down by blunt dissection, vessel seepage being controlled by ligation and compression. Further examination revealed a hard mass of fibrous tissue at the uterine stump, but this mass was believed to be quiescent as catheterization during the period of preoperative observation had not demonstrated any stricture of nor compression on the urethra. The owner was, however, later informed of its existence. The abdomen was closed, using no. 0 14-day chromic catgut for the muscles and peritoneum and no. 1 dermal suture for the skin.

The animal remained hospitalized for ten days more and was closely observed during that period. None of the preoperative symptoms were exhibited and recovery was uneventful.

The case cited well illustrates the value of history, together with careful observation and evaluation of symptoms. It is believed that many more cases of adhesions exist in the dog than are commonly recognized, going undiagnosed because of failure to correlate the unusual symptoms shown with the history of the animal.

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"Is the chorea that results from canine distemper caused by the virus itself, by secondary infection, or by toxins from degenerative tissue?" Dr. L. M. Roderick answers this question as follows: "The virus of canine distemper has a distinct affinity for nervous tissue. The chorea therefore may arise as the result of the myelitis or neuritis which follows infection with the virus."

Sublingual Abscess in a Cow

CLAYTON STEPHENS, D.V.M., Tupelo, Mississippi

The accompanying photograph illustrates extensive swelling and attitude resulting from development of an extensive abscess in the sublingual region.

In this animal, involvement was so intense as to cause the tongue to protude and make deglutition impossible. Inanition was a no less predominating symptom.

After preparation by cleansing the operative area, the abscess was opened at its lowest extremity. In this, attention was given to head position at grazing. A quantity of ropy, light-colored pus was discharged. Water and liquid food were given by stomach tube.

Swelling in this case began decreasing the day following surgical drainage and had entirely disappeared in seven days. The cow was able to eat and drink on the third postoperative day.

No cultures were made and specific etiology was not determined. Several similar cases are observed annually.

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It is the thesis of a recent article[1] by Dr. Gerard Dikmans that the "mode of transmission of anaplasmosis in nature remains unsolved and requires further research". Paradoxically, the report can but be of inestimable value to the numerous specialists who have been confused about the transmission of this infection, and is a review that should prove particularly valuable to those engaged in research.

[1]The Transmission of Anaplasmosis. *Am. Jour. Vet. Res.*, 11:5, 1950.

VETERINARY ITEMS OF INTEREST

Nutrition is the pivot on which hinge animal morbidity statistics.

Cattle and hog numbers in France approximate prewar levels.

An outbreak of foot-and-mouth disease in Venezuela has been reported.

Poultry raising has become one of the most important agricultural industries in many states.

On the thoughtful application of remedies, not the remedy alone, rests the success or failure of disease control.

Activities of the World Health Organization (WHO) are a potent force in the attainment of world peace.

The animal protein factor (APF), which includes the newly-discovered vitamin B_{12}, has been hailed by some authorities as "the greatest nutritional discovery of our lifetime."

Using air at only five pounds per square inch above atmospheric pressure, engineers have found that a ton of wheat an hour can be moved through a one-inch pipe 75 feet long.—*S.N.L.*

Not only is balance among the essential amino acids a prerequisite for adequate nutrition, but it is important to realize that recently there have come to light certain interrelationships of proteins and amino acids with other nutrients of a ration.

The West Virginia Veterinary Medical Association has been active in effecting changes in that state's Veterinary Practice Act. Further efforts are being made to create an office of State Veterinarian for West Virginia, for which there is no statute at present.

It is more dramatic to cure a disease outbreak among animals than prevent one; livestock owners, appreciating the tangible evidence of savings to them, usually pay fees for such services promptly. The undeniable value of prevention over that of treatment is frequently underestimated and growers are reluctant to invest in technical services to accomplish this end; yet such investment has been shown repeatedly to be economically sound.

Beethoven wrote some of his greatest music after becoming deaf.

Montgomery, Ala., was the first capital of the Southern Confederacy.

The three greatest world public health enemies are malaria, tuberculosis and venereal diseases.

About three of every four Koreans are engaged in farming, and agricultural products account for about 75% of the value of all production of that country.

Of the total corn acreage in the United States, over 77% is now planted to hybrid varieties. This is in contrast to the report of one acre in 10,000 planted to hybrid corn in 1933.

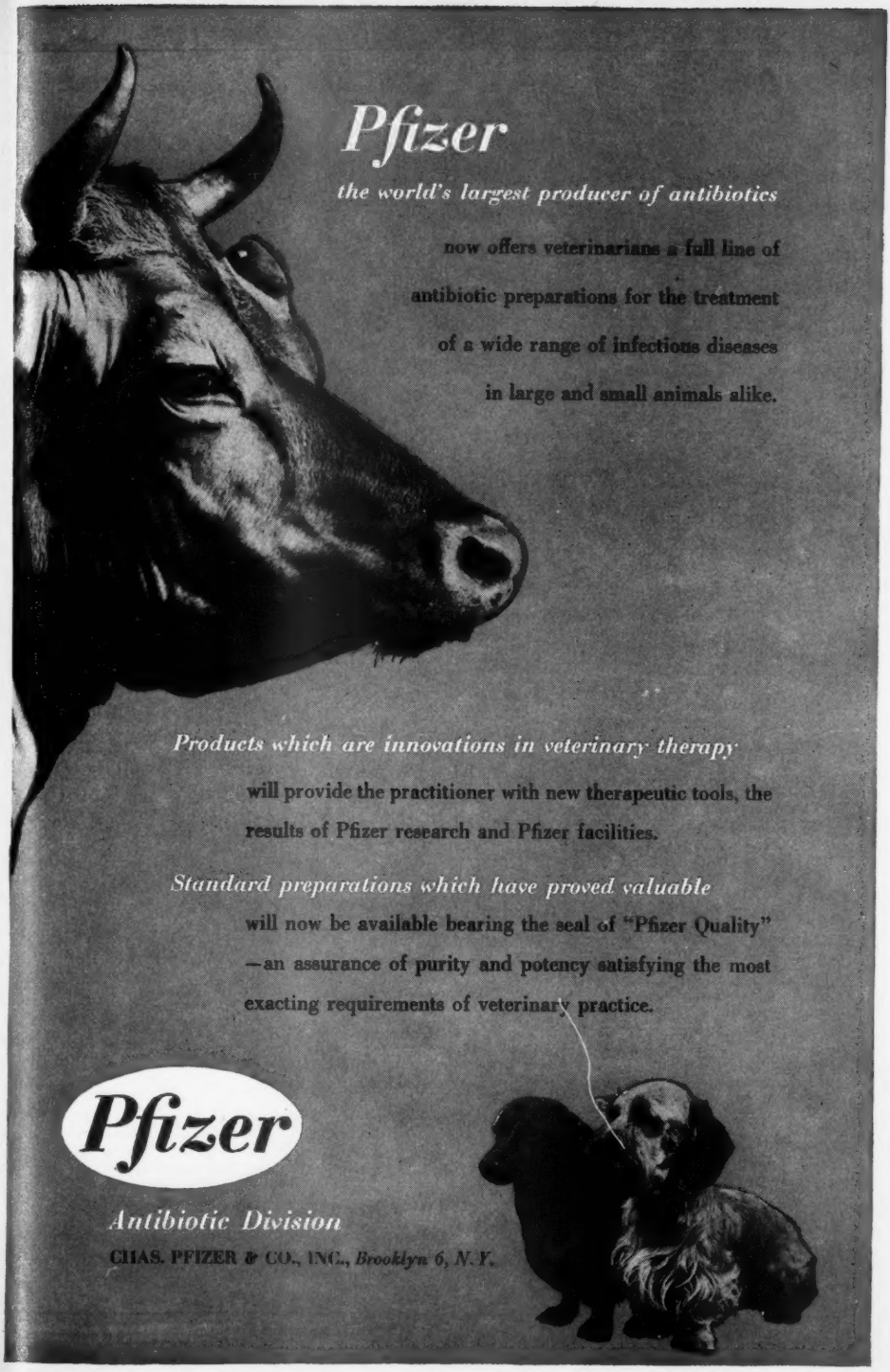
The use of streptomycin in daily doses of 40 mg. per kg. body weight, administered intramuscularly, has proved effective in the treatment of acute and chronic cases of canine leptospirosis.

Bruises in livestock, most of which are caused by careless handling in transit, cost producers $200,000,000. a year.—*W. E. Logan, D.V.M.*

British antilewisite (BAL) has been proved an effective antidote for arsenic, mercury, bismuth, antimony, and chromium intoxication, but is ineffective for lead, thallium, and selenium poisoning.—*George T. Edds, B.S., D.V.M., M.S.*

A black Cocker Spaniel named Brutus has been designated as official mascot of the Mail Advertising and Service Association Convention to be held in New York City this fall. This is the first time a dog has been mascot of a convention.

The Army announced late in August that 10,000,000 lb. of Mexican canned beef and gravy had been transferred from the Commodity Credit Corporation to the Army Quartermaster Corps for overseas rations of troops in the Far East. No facilities at present exist for handling fresh frozen boneless cuts and until such time as this is possible, meat must be provided in canned form.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